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1891

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УВАЖЛИ ОБОЖНАТЪ

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UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL, DIRECTOR

ALTITUDES

BETWEEN

LAKE SUPERIOR AND THE ROCKY MOUNTAINS

BY

WARREN UPHAM



WASHINGTON
GOVERNMENT PRINTING OFFICE
1891

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
U. S. GEOLOGICAL SURVEY, GLACIAL DIVISION,
Madison, Wisconsin, August 4, 1890.

SIR: I have the honor to transmit herewith manuscript for a bulletin on "Altitudes between Lake Superior and the Rocky Mountains," prepared by Assistant Geologist Warren Upham. The value of the large mass of data contained is obvious.

Very respectfully,

T. C. CHAMBERLIN,
Geologist in charge.

Hon. J. W. POWELL,
Director U. S. Geological Survey.

ALTITUDES BETWEEN LAKE SUPERIOR AND THE ROCKY MOUNTAINS.

BY WARREN UPHAM.

INTRODUCTION.

In the survey of Lake Agassiz, a preliminary report of which forms Bulletin No. 39, it was found necessary to ascertain the altitudes determined within its area by railroad surveys as the basis for leveling along the shore lines of that glacial lake, and learning their relations in height to each other, to the great lakes of the St. Lawrence and Nelson Rivers, and to the ocean. From the time of the first observations and description of the upper beaches of Lake Agassiz by the author in 1879 and 1881, for the Geological Survey of Minnesota, and especially since the work was extended in 1885, under the U. S. Geological Survey, to include both sides of this lacustrine area in Minnesota and North Dakota now drained by the Red River of the North, much attention has been given to this collection of altitudes, and to the means of referring them to the sea level. The greater part of Lake Agassiz, however, was in Manitoba and adjacent British Territory, stretching north to the Saskatchewan; and in 1887, jointly for the Geological Surveys of the United States and of Canada, the author continued his examination of the beaches and deltas on the west side of the lake along a distance of a hundred miles north from the international boundary, across the prairie region of southwestern Manitoba, the leveling in this work being based on the altitudes of the Canadian Pacific Railway and its branches and connecting railways.

When it was decided to publish these notes of altitudes in a separate bulletin for convenient reference, their area was somewhat extended, to cover the natural district between Lake Superior and the Rocky Mountains. The list of railroads here tabulated includes a few lines, mostly built within recent years, in northern Michigan and Wisconsin, every railroad line of Minnesota and North and South Dakota, nearly all in Montana, several lines in northern Iowa, and one in northern Nebraska.

and Wyoming. Three lines which lie partly in Minnesota and South Dakota are noted through Iowa, Illinois, and Missouri, to Chicago, Burlington, and St. Joseph, each giving important connections at its southern end with leveling from the sea; and the Northern Pacific Railroad is similarly given in its whole extent westward through Idaho, Oregon, and Washington. In the Dominion of Canada the entire railway system from Port Arthur, on Lake Superior, to Vancouver, on the Pacific, is presented; but a portion of the Canadian Pacific profile in British Columbia requires revision for the elimination of an error of about 40 feet, which can probably be detected only by leveling.

The aggregate length of these railroads is about 18,500 miles. Nearly two-thirds have been noted by the author from the original profiles, kindly submitted to his examination in the offices of the railroad engineers, chiefly in St. Paul, Minneapolis, and Winnipeg; and in stating the sources of information for the several lines, these are distinguished as derived "from profiles." The other lines of which data have been obtained by correspondence, being copied from the profiles or notebooks by the engineers or their assistants, are credited to them directly.

All the altitudes of stations, summits and depressions of grade, bridges, and other points on railroads, refer to the top of the rail. The depth cut, or the altitude of the natural surface, is also generally stated at summits, and at the crossings of the principal streams the stages of low and high water are recorded in all cases where they could be obtained. For better identification of the localities, and for convenience in comparing them and determining their connecting gradients, the distances of all the points noted are given in miles and tenths, usually from one of the termini of the line or of its railroad system.

Three series of levels, connecting this district in the center of the continent with the sea, namely, by the United States Lake Survey from the Atlantic Ocean at New York, by the Mississippi River Commission from the Gulf of Mexico, and by the Northern Pacific Railroad to the Pacific Ocean, agree within 2 feet at St. Paul, and this, after the Lake Superior level, may be regarded as the most important datum for referring most of these series of altitudes to the ocean. The mean height of Lakes Michigan and Huron above mean tide sea-level is determined, according to Maj. A. Mackenzie, of the Corps of Engineers, United States Army, as 581.28 feet by the Lake Survey, and 580.83 feet by the Mississippi River Commission. Accepting the former, the mean altitude of Lake Superior from November, 1870, to January, 1888, derived from Lake Huron by leveling at the Sault Ste. Marie, is 601.56 feet, or approximately 602 feet. This is taken as the plane of reference for the Northern Pacific Railroad, the Canadian Pacific Railway, the St. Paul and Duluth Railroad, and their branches. Besides the three series of leveling already mentioned, by which the altitude of extreme low water (in 1864) of the Mississippi River at St. Paul is obtained, several

other determinations of this datum by railroad surveys from Lakes Superior and Michigan are placed after these in the following table:

Determinations of the altitude of low water of the Mississippi River at St. Paul.

| | Feet above mean sea-level. |
|--|----------------------------------|
| From the United States Lake Survey, Lake Superior being 602 feet, according to Maj. C. J. Allen, of the United States Engineers, St. Paul (Annual Report of the Chief of Engineers, U. S. Army, for 1881, p. 1813)..... | 683.04 |
| From the Mississippi River Commission and the continuation of its levels to St. Paul (letter of Maj. A. Mackenzie, of the United States Engineers, Rock Island, dated January 23, 1888)..... | 684.75 |
| From the Northern Pacific Railroad surveys, by connection of its series of levels with mean tide of the Pacific Ocean at Tacoma (according to profiles in the Northern Pacific engineer's office, St. Paul)..... | 685 |
| From original surveys for the Lake Superior and Mississippi (now the St. Paul and Duluth) Railroad (notes of J. T. Sewall, surveyor, March, 1863)..... | 683 |
| From the St. Paul and Duluth Railroad profile used in the construction of the road..... | 680.5 |
| From the St. Paul and Duluth Railroad profile, new leveling in 1887 along its entire extent..... | 683 |
| From profiles of the Northern Pacific and the St. Paul and Northern Pacific Railroads, by way of Brainerd..... | 684 |
| From profiles of the Northern Pacific, the Northern Pacific, Fergus and Black Hills, and the St. Paul, Minneapolis and Manitoba Railroads, by way of Wadena, Fergus Falls, and St. Cloud..... | 683 |
| From Lake Superior by the Chicago, St. Paul, Minneapolis, and Omaha Railway profile..... | 686 |
| From Lake Superior by the Minneapolis, Sault Ste. Marie, and Atlantic Railway profile..... | 680 |
| From Lake Michigan by the Chicago, St. Paul, and Kansas City Railway profile..... | 681 |
| From Lake Michigan by the Chicago and Northwestern Railway to Winona, and thence to St. Paul by leveling of United States Engineers (Gannett's Lists of Elevations, 1877, p. 3, corrected to accord with the height of Lake Michigan determined by the United States Lake Survey)..... | 682.5 |

The mean of these twelve determinations is almost exactly 683 feet, as given by Major Allen; and the altitudes herein noted for St. Paul and Minneapolis and the railroads radiating from these cities are thereby referred to the sea level. The probable limit of error in the heights given by the Lake Survey for Lakes Michigan, Huron, and Superior, is only a fraction of a foot; and almost equal accuracy seems to be attained in this datum of reference at St. Paul.

Most of the railroad profiles here tabulated have been found, after reference to the common datum of the sea level, to agree exactly or within one or two feet at their points of intersection or junction with each other; and where so small adjustments were required, they have been made at these points without statement of them. Larger discrepancies are harmonized by locating their adjustment at one or more points which are definitely noted, with the amount of the corrections. Distribution of adjustments by gradual addition or subtraction along a considerable distance has been avoided, that the altitudes here published

may represent, as nearly as possible, the data of the original profiles. Whenever opportunities for better revision are afforded by additional surveys or by more definite and trustworthy means of comparison, these figures and adjustments may be further corrected with full knowledge of the original as well as the later surveys.

Exact or close agreements throughout nearly the entire extent of this complex network of railroads give good assurance of the correct reference of almost every portion to the sea level, with possible limits of error not exceeding a few feet. Thus the altitudes of Winnipeg, Portage la Prairie, Brandon, and the great lakes of Manitoba, of Regina and Medicine Hat in Assiniboia, of Calgary in Alberta, of Grand Forks, Devil's Lake, Minot, Buford, Fargo, Jamestown, and Bismarck, in North Dakota, of Aberdeen, Watertown, Sioux Falls, and Yankton, in South Dakota, and of Glendive, Livingston, Great Falls, and Helena, in Montana, appear to be determined with nearly as close accuracy as St. Paul and the Laurentian lakes.

The altitudes of every railroad in the basin of Lake Agassiz, and the heights of its beaches and deltas determined therefrom by continuous leveling along a thousand miles or more of its shore lines, seem to be correctly known throughout within less than five feet of possible error. This is especially important, as the beaches of Lake Agassiz are not now horizontal but have slight ascents northward, presenting very interesting problems for investigation, as to the amount of these changes in comparison with the sea level, when they were produced, and their causes.

This work will also be of value in studies of stratigraphic geology, and probably at some future time in determining the amount and rate of uplifts and depressions of the earth's crust; it will be the basis of reference in the preparation of contoured maps of this region; and it will be consulted by engineers in planning new railroad routes, improvements of the navigation of rivers, the utilization of water-power, and the construction of reservoirs and canals for irrigation.

Much space is accordingly given to the separate tabulation of the elevations of the principal rivers, so far as they are known from these railroad surveys and from other means of determination. In this connection the reports of the Mississippi and Missouri River Commissions afford valuable data of the lowest and highest stages of these rivers at various points where gauge records have been taken. The Commission reports refer these elevations either to zero of the several gauges (and these to the Cairo datum plane), as on the Mississippi, or to the St. Louis directrix, as on the Missouri; but in the tabulation of this bulletin they are referred to mean sea level, permitting more ready comparison of these records among themselves and with the other altitudes herein published.

The general index is arranged in three parts, giving references first for hills and mountains; second, for lakes; and third, for towns and

railroad stations. Each of these parts is further subdivided under the several states, and north of the international boundary under the several provinces of British America. The index notes the page or pages where the altitudes appear in the previous tabulation of the various railroad profiles and river systems, by reference to which their relations with other altitudes determined in their vicinity may be learned; but, after the page references, the index also gives the altitude of the hill, mountain, lake, town, or station cited, for the convenience of those who wish only the single altitude, without comparison with others or information as to the method of its determination.

Acknowledgments for assistance in this work are due, and are gratefully tendered, to Mr. Henry Gannett, of this Survey; to Prof. N. H. Winchell, State Geologist of Minnesota; to Mr. A. J. Hill, of St. Paul, who was the first to collect, more than twenty years ago, the principal part of the hypsometric data then determined by the early railroad surveys having offices in that city; to Major C. J. Allen, Major A. Mackenzie, and General O. M. Poe, of the United States Corps of Engineers; to S. D. Mason and Richard Relf, engineers of the Northern Pacific Railroad, by whom every facility has been courteously granted for the examination of their maps and profiles; to P. A. Peterson and R. M. Pratt, engineers of the Canadian Pacific Railway, for similar aid; likewise to George H. Webster, engineer of the Manitoba and Northwestern Railway; to N. D. Miller, engineer of the Great Northern (formerly the Saint Paul, Minneapolis and Manitoba) Railway, for opportunity to examine all the profiles of this great railway system; to George H. White, M. D. Rhame, and George B. Woodworth, of the Chicago, Milwaukee and St. Paul Railway; to the many other engineers, whose names appear in connection with the altitudes received from them, or copied by the author from profiles in their offices; to Collingwood Schreiber, in charge of Canadian Government railways; and to Dr. George M. Dawson and Dr. Robert Bell, of the Geological and Natural History Survey of Canada.

FLUCTUATIONS OF LAKE SUPERIOR, NOVEMBER, 1870, TO JANUARY, 1888.

Table showing in feet the mean elevation of Lake Superior above mean tide at New York, by months, from observations made above the locks at St. Mary's Falls canal, Mich., beginning November, 1870.

[From Gen. O. M. Poe, Lt. Col. of Engineers, U. S. Army, Detroit, Mich., February 14, 1888.]

| Years. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Annual means, Nov. 1 to Oct. 31. | Annual means, Jan. 1 to Dec. 31. |
|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------------------------------|----------------------------------|
| 1870..... | | | | | | | | | | | 601.84 | 601.64 | | |
| 1871..... | 601.16 | 601.03 | 600.74 | 600.95 | 601.44 | 601.85 | 602.04 | 601.95 | 602.00 | 601.83 | 1.60 | 1.24 | 601.54 | 601.49 |
| 1872..... | 0.97 | 0.86 | 0.66 | 0.58 | 1.47 | 1.60 | 1.97 | 2.36 | 2.43 | 2.30 | 2.17 | 1.75 | 1.50 | 1.59 |
| 1873..... | 1.34 | 1.13 | 1.17 | 1.17 | 1.70 | 1.86 | 2.39 | 2.60 | 2.64 | 2.54 | 2.42 | 2.15 | 1.87 | 1.93 |
| 1874..... | 1.50 | 1.34 | 1.21 | 1.11 | 1.60 | 1.93 | 2.33 | 2.36 | 2.35 | 2.48 | 2.37 | 2.12 | 1.90 | 1.89 |
| 1875..... | 1.76 | 1.46 | 1.43 | 1.64 | 1.97 | 2.26 | 2.34 | 2.36 | 2.64 | 2.55 | 2.26 | 1.68 | 2.07½ | 2.03 |
| 1876..... | 1.66 | 1.60 | 1.43 | 1.38 | 1.77 | 2.74 | 3.16 | 3.20 | 3.22 | 2.90 | 2.62 | 2.13 | 2.25 | 2.32 |
| 1877..... | 1.85 | 1.86 | 1.75 | 1.61 | 1.57 | 1.87 | 2.16 | 2.32 | 2.07 | 2.08 | 1.88 | 1.67 | 1.99 | 1.89 |
| 1878..... | 1.47 | 1.20 | 1.13 | 1.12 | 1.13 | 1.62 | 1.73 | 1.68 | 1.44 | 1.54 | 1.42 | 1.23 | 1.47 | 1.39 |
| 1879..... | 0.80 | 0.38 | 0.21 | 0.34 | 0.67 | 0.88 | 1.05 | 1.15 | 1.09 | 1.09 | 0.95 | 0.56 | 0.86 | 0.76 |
| 1880..... | 0.36 | 0.28 | 0.19 | 0.23 | 0.92 | 1.73 | 1.96 | 1.84 | 1.99 | 1.75 | 1.79 | 1.54 | 1.06 | 1.21½ |
| 1881..... | 1.19 | 1.10 | 1.12 | 1.04 | 1.44 | 1.65 | 1.87 | 1.77 | 1.95 | 2.44 | 2.30 | 1.95 | 1.57½ | 1.65 |
| 1882..... | 1.47 | 1.27 | 1.17 | 1.13 | 1.52 | 1.62 | 1.96 | 2.05 | 1.97 | 1.90 | 1.84 | 1.55 | 1.69 | 1.62 |
| 1883..... | 1.15 | 1.04 | 1.06 | 1.12 | 1.13 | 1.47 | 1.67 | 2.02 | 1.74 | 1.58 | 1.43 | 1.23 | 1.45 | 1.39 |
| 1884..... | 1.11 | 1.08 | 0.96 | 0.68 | 1.15 | 1.14 | 1.38 | 1.42 | 1.48 | 1.57 | 1.62 | 1.43 | 1.22 | 1.25 |
| 1885..... | 1.22 | 1.13 | 1.00 | 0.82 | 1.37 | 1.74 | 1.92 | 2.13 | 1.88 | 1.73 | 1.55 | 1.35 | 1.50 | 1.49½ |
| 1886..... | 1.01 | 0.84 | 0.84 | 0.82 | 1.30 | 1.46 | 1.65 | 1.78 | 1.64 | 1.61 | 1.61 | 1.19 | 1.33 | 1.42 |
| 1887..... | 0.95 | 0.84 | 0.77 | 0.64 | 1.01 | 1.44 | 1.78 | 1.70 | 1.56 | 1.73 | 1.50 | 1.10 | 1.27 | 1.25 |
| 1888..... | 0.95 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sums..... | 21.92 | 18.44 | 16.84 | 16.38 | 23.16 | 28.86 | 33.36 | 34.69 | 34.09 | 33.62 | 33.27 | 27.51 | 26.55 | 26.58 |
| Means..... | 601.22 | 601.08 | 600.99 | 600.96 | 601.36 | 601.70 | 601.97 | 602.04 | 602.01 | 601.98 | 601.85 | 601.53 | 601.56 | 601.56 |

Highest mean for 1 month, September, 1876 603.22
Lowest mean for 1 month, March, 1880 600.19

Range of mean elevation for 1 month during 17 years..... 3.03

Highest monthly mean, August..... 602.04
Lowest monthly mean, April..... 600.96

Range of monthly mean during 17 years..... 1.08

Highest annual mean, November 1, 1875, to October 31, 1876..... 602.25
Lowest annual mean, November 1, 1878, to October 31, 1879..... 600.86

Range of annual mean, November 1 to October 31, during 17 years..... 1.39

Highest annual mean, January 1 to December 31, 1876..... 602.32
Lowest annual mean, January 1 to December 31, 1879..... 600.76

Range of annual mean, January 1 to December 31, during 17 years..... 1.56

Mean elevation of surface of Lake Superior November 1, 1870, to January 31, 1888, 601.56 feet.

ALTITUDES OF RAILROADS.

NORTHERN PACIFIC RAILROAD SYSTEM.

MAIN LINE.

[From profile in the office of S. D. Mason, engineer, and Richard Relf, assistant engineer, St. Paul.]

The profile westward to the first crossing of Clark's Fork of the Columbia River is referred to sea level by calling Lake Superior 600 feet. A uniform addition of 2 feet is accordingly made here to the main line and its branches throughout this distance, as required by the United States Lake Survey. With this change a discrepancy of only 2 feet remains where this portion connects with the leveling from the Pacific Ocean, which gives elevations 2 feet higher than the leveling from Lake Superior. ,

| | From Duluth. | Above the sea. |
|--|--------------|----------------|
| | Miles. | Feet. |
| Lake Superior, mean surface, from Jan. 1, 1871, to Dec. 31, 1875 (Report of United States Lake Survey)..... | 0·0 | 601·78 |
| Same, from Nov. 1, 1870, to Jan. 31, 1888, according to United States engineer's gauge, Sault Ste. Marie..... | 0·0 | 601·56 |
| Duluth, freight depot and elevators (three-fourths mile east from the passenger depot) | 0·0 | 607 |
| Duluth, passenger depot..... | 0·0 | 607 |
| Oneota | 3·8 | 631 |
| Summit level | 4·7-5·4 | 637 |
| Oneota Junction, St. Paul and Duluth Short Line..... | 5·9 | 629 |
| Spirit Lake Station | 7·8 | 610 |
| Fond du Lac | 13·5 | 607 |
| Masson Creek, water, 607; grade..... | 14·0 | 622 |
| Little River, bed, 662; grade | 16·4 | 733 |
| Conglomerate Creek, bed, 696; grade..... | 17·4 | 789 |
| Greeley | 18·2 | 838 |
| Thomson | 21·7 | 1032 |
| St. Louis River, Dalles bridge, bed, 992; low and high water, 997-1,020; grade | 22·0 | 1044 |
| Northern Pacific Junction, St. Paul and Duluth Railroad. (This railroad from Duluth to the Northern Pacific junction is owned jointly by the St. Paul and Duluth and Northern Pacific Railroad Companies.) | 23·0 | 1083 |
| Otter Creek, bed..... | 26·4 | 1128 |
| Pine Grove | 28·3 | 1237 |
| Sawyer (formerly Norman)..... | 33·5 | 1317 |
| Corona | 39·0 | 1303 |
| Kettle River, bed | 41·1 | 1287 |
| Summit, natural surface..... | 44·0 | 1331 |
| Cromwell (at Island Lake)..... | 45·0 | 1306 |
| Tamarack River, bed, 1,287; grade..... | 50·7 | 1301 |
| Wright | 51·0 | 1309 |
| Tamarack (Sicottes) Station..... | 57·1 | 1271 |
| Hay River, bed, 1,228; grade..... | 61·2 | 1238 |
| Summit, natural surface..... | 61·8 | 1244 |
| Hay River, second crossing, bed, 1,222; grade..... | 63·0 | 1232 |
| Sandy River, bed, 1,219; grade..... | 64·3 | 1228 |
| McGregor | 66·0 | 1228 |
| Portage Lake, grade | 71·3 | 1220 |
| Summit, natural surface..... | 72·8 | 1266 |
| Kimberly | 75·0 | 1237 |
| Bice River, bed, 1,209; water, 1,213; grade..... | 75·5 | 1228. |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

| | From Duluth. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Summit, natural surface..... | 79·8 | 1254 |
| Rosaburg | 80·9 | 1222 |
| Sisabagama Creek, bed, 1,206; grade..... | 82·5 | 1214 |
| Summit, natural surface..... | 84·3 | 1241 |
| Mud River, bed, 1,191; grade..... | 86·7 | 1205 |
| Aitkin | 86·8 | 1208 |
| Outlet of Pickerel Lake, bed, 1,208; grade..... | 88·6 | 1215 |
| Summit, natural surface..... | 89·2 | 1224 |
| Cedar River, bed, 1,199; grade..... | 90·8 | 1212 |
| Cedar Lake Station | 92·0 | 1222 |
| Summit, natural surface, 1,306; grade..... | 96·5 | 1298 |
| Deerwood..... | 97·3 | 1277 |
| Swamp, grade..... | 99·0 | 1268 |
| Summit, natural surface, 1,308; grade..... | 102·6 | 1290 |
| Jonesville..... | 106·8 | 1238 |
| Brainerd, junction of St. Paul and Northern Pacific Rail- road | 113·9 | 1207 |
| Brainerd Station, 138 miles from St. Paul..... | 114·0 | 1209 |
| Mississippi River, bed, 1,144; extreme low water (1874), 1,150; extreme high water (1866), 1,167; grade..... | 114·5 | 1211 |
| Depression, grade..... | 115·1 | 1196 |
| Baxter..... | 118·0 | 1205 |
| Summit, natural surface..... | 119·9 | 1212 |
| Gull River, bed, 1,165; water, 1,170; grade..... | 121·5 | 1191 |
| Gull River Station | 121·8 | 1191 |
| Summit, natural surface..... | 123·7 | 1210 |
| Sylvan Lake Station | 124·0 | 1207 |
| Pillager Creek, bed, 1,172; water, 1,175; grade..... | 126·8 | 1195 |
| Pillager..... | 127·5 | 1203 |
| Wheelock (formerly Bath)..... | 132·5 | 1214 |
| Crow Wing River, bed, 1,205; water, low stage, 1,208; grade..... | 135·5 | 1225 |
| Motley..... | 136·0 | 1227 |
| Hayden, at a summit of grade, natural surface, 1,257; grade..... | 140·4 | 1255 |
| Hayden Brook, bed, 1,230; grade..... | 142·5 | 1243 |
| Staples' Mills, junction of new line of St. Paul and North- ern Pacific Railroad, 141·6 miles from St. Paul..... | 143·8 | 1274 |
| Dower Lake Station (a summit of grade)..... | 145·8 | 1293 |
| Summit, natural surface..... | 150·1 | 1344 |
| Aldrich..... | 150·5 | 1327 |
| Partridge River, bed, 1,306; water, 1,307; grade..... | 150·7 | 1325 |
| Verndale..... | 154·5 | 1349 |
| Wing River, bed, 1,314; grade..... | 155·7 | 1330 |
| Summit, natural surface..... | 157·4 | 1359 |
| East branch of Union Creek, bed, 1,328; grade..... | 160·1 | 1343 |
| West branch of Union Creek, bed, 1,323; grade..... | 160·5 | 1343 |
| Wadena..... | 161·0 | 1350 |
| Wadena Junction, Northern Pacific, Fergus Falls and Black Hills Railroad..... | 162·9 | 1352 |
| Summit, natural surface..... | 163·2 | 1356 |
| Oak Creek, bed, 1,310; grade..... | 164·7 | 1326 |
| Leaf River, bed, 1,303; water, 1,305; grade..... | 165·5 | 1315 |
| Bluffton..... | 166·0 | 1323 |
| Bluff Creek, bed, 1,308; grade..... | 166·1 | 1329 |
| Little Run, bed, 1,328; grade..... | 167·0 | 1341 |
| Amboy..... | 169·3 | 1378 |
| New York Mills..... | 174·0 | 1410 |
| Summit, natural surface, highest on this railroad in Min- nesota..... | 176·4 | 1433 |
| Richland..... | 179·0 | 1396 |
| Otter Tail River, bed, 1,324; water, 1,327; grade..... | 182·7 | 1343 |
| Perham..... | 184·8 | 1370 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

| | From Duluth. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Luce..... | 190.0 | 1373 |
| Otter Tail River, second crossing, bed, 1,340; grade..... | 191.9 | 1361 |
| Thompson's Lake, grade..... | 193.4 | 1372 |
| Hobart..... | 194.6 | 1386 |
| Summit, natural surface..... | 195.3 | 1404 |
| Otter Tail River, third crossing, bed, 1,358; grade..... | 195.4 | 1385 |
| Frazee..... | 196.0 | 1389 |
| Summit, natural surface..... | 200.7 | 1422 |
| Johnson..... | 201.0 | 1394 |
| Depression at Detroit Lake, grade..... | 204.1 | 1347 |
| Pelican River, bed, 1,339; grade..... | 205.2 | 1352 |
| Detroit..... | 206.0 | 1364 |
| Summit, natural surface, 1,397; grade..... | 208.0 | 1390 |
| Cut, 31 feet deep, grade..... | 210.1 | 1377 |
| Audubon..... | 213.0 | 1310 |
| Creek, bed, 1,270; grade..... | 214.1 | 1295 |
| Summit, natural surface..... | 216.4 | 1350 |
| Lake Park..... | 218.5 | 1336 |
| Hay Creek, bed, 1,253; grade..... | 220.4 | 1286 |
| Hay Creek, bed, 1,202; grade..... | 223.6 | 1207 |
| Hillsdale..... | 224.0 | 1197 |
| Hay Creek, bed, 1,167; grade..... | 225.9 | 1180 |
| Winnipeg Junction, Duluth and Manitoba Railroad..... | 226.6 | 1181 |
| Buffalo River, bed, 1,150; grade..... | 226.8 | 1166 |
| Same, second crossing, bed, 1,143; grade..... | 227.5 | 1157 |
| Same, third crossing, bed, 1,140; grade..... | 228.1 | 1152 |
| Same, fourth crossing, bed, 1,133; grade..... | 229.3 | 1143 |
| Same, fifth crossing, bed, 1,131; grade..... | 229.6 | 1146 |
| Hawley..... | 230.0 | 1151 |
| Summit, natural surface, 1,198; grade..... | 231.0 | 1193 |
| Upper or Herman Beach of Lake Agassiz, natural surface at crest of beach ridge, 1,114; natural surface 12 to 125 rods east of crest of beach ridge, 1,097 to 1,100; base of beach ridge, 25 rods west from crest, 1,099; grade of railroad at intersection of the beach ridge..... | 233.7 | 1100 |
| Muskoda..... | 234.0 | 1090 |
| Campbell Beach of Lake Agassiz, 30 rods wide, crest, 1,004, with descent of 4 feet east and 11 feet west; grade..... | 237.1 | 998 |
| Second Campbell Beach, about 50 rods wide, crest, 1,000, with descent of 7 feet east and 19 feet west; grade..... | 237.4 | 988 |
| McCauleyville Beach, about 20 rods wide, crest, 983, with descent of 3 feet east and 10 feet west; grade..... | 237.6 | 979 |
| Buffalo River, bed, 940; grade..... | 238.4 | 957 |
| (There is no ascent west of this river, the grade all the way to Glyndon being lower than on the bridge.) | | |
| Stockwood..... | 238.6 | 948 |
| Glyndon..... | 242.8 | 925 |
| South branch of Buffalo River, bed, 896; grade..... | 244.9 | 917 |
| Tenny..... | 245.3 | 922 |
| Dilworth..... | 248.2 | 909 |
| Moorhead..... | 251.5 | 905 |
| Red River of the North, bed, 862; extreme low water, 866; extreme high water (1882), 898; ordinary low and high water, 870-885 or 890; grade..... | 252.0 | 905 |
| Fargo..... | 252.5 | 905 |
| (Thence a level grade, 905 or in part 904½, extends west 12 miles.) | | |
| Junction, Fargo and Southwestern Railroad..... | 253.7 | 905 |
| Haggart..... | 257.0 | 905 |
| Shenoyenne River, bed, 881; grade..... | 258.2 | 905 |
| Canfield..... | 261.0 | 905 |
| Mapeton..... | 265.0 | 905 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

| | From Duluth. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Maple River, bed, 886; water, 888; grade | 265.3 | 908 |
| Beach ridge of Lake Agassiz, 10 feet high and 60 rods wide (including the slopes), crest, 919; grade of rail road | 267.4 | 916 |
| Greene | 267.5 | 916 |
| Dalrymple | 270.5 | 922 |
| Casselton | 272.8 | 934 |
| Goose Creek, bed, 928; grade | 272.9 | 935 |
| Crossing the St. Paul, Minneapolis and Manitoba Railway, line from Everest to Mayville | 273.2 | 938 |
| Sidney, at crossing of the St. Paul, Minneapolis and Manitoba Railway, line from Everest to Hope | 276.3 | 954 |
| Campbell Beach of Lake Agassiz, crest, 994; grade | 279.1 | 987 |
| (This beach ridge is 60 rods wide (including the slopes), and rises 15 feet above the nearly level expanse thence eastward. Its crest is 10 feet above the hollow, 40 rods wide, on its west side.) | | |
| Wheatland | 279.3 | 993 |
| Big Cooley, bed, 1,057; grade | 283.2 | 1076 |
| Magnolia | 283.4 | 1077 |
| Upper or Herman Beach of Lake Agassiz, crest, 1,101; grade | 283.9 | 1092 |
| (This beach ridge is about 40 rods wide. Its crest is 20 feet above the nearly level land on the east and 7 feet above the depression on its west side. The ascent thence westward rises to 1,101 feet in a third of a mile.) | | |
| Summit, natural surface and grade | 288.5 | 1208 |
| Buffalo | 288.8 | 1202 |
| Maple River, water, 1,130; grade | 291.6 | 1140 |
| Tower City | 294.8 | 1172 |
| Oriska | 300.3 | 1270 |
| Summit, natural surface, 1,442; grade | 304.5 | 1438 |
| Alta | 305.3 | 1427 |
| Sheyenne River, bed, 1,200; grade | 310.0 | 1230 |
| Valley City | 310.5 | 1220 |
| Hobart | 318.3 | 1419 |
| Sanborn, junction of Sanborn, Cooperstown and Turtle Mountain Railroad | 322.0 | 1444 |
| Beside Lake Eckelson, natural surface marshy, 1401-1402; grade | 324.5-324.9 | 1417 |
| (On the west side of Lake Eckelson a steep bluff rises 40 feet to 1,442; on the east a gradual ascent rises to 1,432.) | | |
| Eckelson | 325.5 | 1445 |
| Urbana | 330.8 | 1472 |
| Spiritwood | 334.8 | 1479 |
| Spiritwood Cooley (or Seven-Mile Creek), bed, 1,403; grade | 337.4 | 1414 |
| Bloom | 339.8 | 1486 |
| Summit, natural surface and grade | 342.5 | 1495 |
| Jamestown, junction of the James River Valley Railroad | 345.5 | 1408 |
| James River, bed, 1,382; grade | 345.7 | 1397 |
| Junction of the Jamestown and Northern Railroad | 346.5 | 1399 |
| Eldridge | 352.5 | 1541 |
| Windsor | 362.0 | 1840 |
| Cleveland | 365.8 | 1842 |
| Medina | 374.5 | 1794 |
| Crystal Springs | 382.5 | 1792 |
| Tappen | 390.8 | 1762 |
| Long Slough, bottom, 1,734; grade | 392.7 | 1738 |
| Dawson | 396.0 | 1748 |
| Steele | 404.0 | 1853 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

| | From Duluth. | Above the sea. |
|---|--------------|----------------|
| | Miles. | Feet. |
| Geneva | 410.8 | 1835 |
| Driscoll | 415.0 | 1871 |
| Sterling | 422.5 | 1867 |
| Summit of the Coteau du Missouri, here inconspicuous, average of natural surface, 1,900; highest grade | 423.8 | 1882 |
| McKenzie | 428.8 | 1698 |
| Menoken | 434.0 | 1720 |
| Apple Creek Station | 443.0 | 1644 |
| Apple Creek, water | 443.0 | 1626 |
| Bismarck | 447.0 | 1670 |
| Missouri River, low water, 1,618; highest water in ordi- nary years, 1,638; same, in spring of 1881 and 1887, 1,646; grade | 449.2 | 1692 |
| Bluff close east of this bridge | | 1747 |
| Bottom land of Missouri River | 449.5-451.5 | 1632-1637 |
| Mandan | 452.2 | 1646 |
| Heart River: | | |
| First crossing, water, 1,634; grade | 453.1 | 1649 |
| Second crossing, water, 1,635; grade | 453.8 | 1648 |
| Third crossing, water, 1,638; grade | 454.9 | 1655 |
| Sunnyside | 455.2 | 1658 |
| Heart River: | | |
| Fourth crossing, water, 1,643; grade | 456.2 | 1660 |
| Fifth crossing, water, 1,645; grade | 456.7 | 1659 |
| Sixth crossing, water, 1,646; grade | 457.6 | 1662 |
| Cut, 40 feet deep; grade | 459.9 | 1728 |
| Marmot | 460.7 | 1731 |
| Sweet Brier Creek: | | |
| First crossing, water, 1,679; grade | 462.4 | 1695 |
| Second crossing, water, 1,686; grade | 463.0 | 1703 |
| Third crossing, water, 1,691; grade | 463.4 | 1707 |
| Sweet Brier Station | 468.0 | 1806 |
| Sweet Brier Creek, one of many crossings of this stream, this being "where the main Sweet Brier comes in from the north," water, 1,848; grade | 471.5 | 1871 |
| Sedalia | 476.3 | 2032 |
| Summit between the Sweet Brier and the Blue Grass Val- leys, natural surface and grade the same | 479.7 | 2164 |
| New Salem | 479.9 | 2163 |
| Blue Grass Station | 483.5 | 2041 |
| Cold Spring tank | 486.1 | 1984 |
| Sims Station, siding at Bly's coal mine | 487.3 | 1962 |
| Summit between Hailstorm and Curlew Creeks, cutting 30 feet; grade | 491.3 | 1916 |
| Almont | 492.5 | 1920 |
| Curlew Creek, first crossing, water, 1,912; grade | 494.5 | 1934 |
| Curlew siding | 497.7 | 1956 |
| Kurtz | 504.6 | 2025 |
| Glenullen | 509.7 | 2070 |
| Eagle's Nest siding | 515.0 | 2098 |
| Summit between Curlew Creek and Big Knife River, natural surface and grade the same | 519.5 | 2151 |
| Big Knife River, first crossing, water, 2,134; grade | 521.4 | 2148 |
| Hebron | 522.1 | 2158 |
| Knife River siding | 523.7 | 2188 |
| Antelope siding | 531.4 | 2411 |
| Summit opposite to Young Man's Butte, cutting 4 feet; grade | 533.2 | 2458 |
| Richardton | 537.1 | 2466 |
| Taylor | 542.6 | 2488 |
| Crossing of Fort Keogh stage road; grade | 547.3 | 2471 |
| Gladstone | 550.3 | 2348 |
| Green River, low and high water, 2,277-2,291; grade | 551.1 | 2313 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

| | From Duluth. | Above the sea. |
|---|--------------|----------------|
| | Miles | Feet. |
| Upper Heart River, first crossing, low and high water, 2,285-2,300; grade | 553.0 | 2308 |
| Grade at "16-ft. vein of good coal." | 557.2 | 2352 |
| Dickinson | 561.6 | 2405 |
| Eland | 565.6 | 2436 |
| South Heart siding | 573.1 | 2482 |
| Belfield | 581.9 | 2579 |
| Fryburg Spur | 587.5 | 2768 |
| Summit between Heart River and the Little Missouri River, cutting 16 feet; grade | 588.1 | 2786 |
| (Thence westward the profile is very irregular, crossing the "Bad Lands," with frequent cuts and fills of 20 to 50 feet.) | | |
| Sully Springs | 593.0 | 2575 |
| Summit between Sully and Poland Creeks, cutting 29 feet; grade | | |
| Scoria | 595.8 | 2514 |
| Medora | 596.6 | 2482 |
| Medora | 601.1 | 2267 |
| Little Missouri River, bed, 2,244; high water, 2,259; grade | 601.5 | 2271 |
| Little Missouri Station | 601.7 | 2266 |
| Andrews | 609.6 | 2478 |
| Sentinel Butte siding | 617.8 | 2709 |
| Summit between Andrews and Beaver Creeks, cutting 8 feet; grade | 620.8 | 2807 |
| Beach | 626.1 | 2756 |
| Line between North Dakota and Montana | 628.2 | 2811 |
| McClellan | 635.0 | 2687 |
| Mingusville | 637.0 | 2652 |
| Beaver Creek here, bed, 2,630; high water, 2,640. | | |
| Summit between Beaver and Glendive Creeks, natural surface and grade the same | 640.3 | 2837 |
| Beaver Hill Station | 641.0 | 2757 |
| Hodges | 647.4 | 2508 |
| Allard | 657.4 | 2216 |
| Glendive Creek, lowest crossing, bed, 2,049; grade | 664.4 | 2076 |
| Glendive | 667.6 | 2069 |
| Yellowstone River here, ordinary low water about 2,045. | | |
| Milton | 682.2 | 2116 |
| Fallon | 697.0 | 2208 |
| O'Fallon Creek, low water | 697.0 | 2147 |
| Terry | 706.8 | 2242 |
| Powder River, low water | 716.0 | 2201 |
| Blatchford | 716.9 | 2247 |
| Ainslie | 726.3 | 2274 |
| Dixon | 737.2 | 2322 |
| Miles City | 746.0 | 2355 |
| Tongue River, low water | 747.0 | 2345 |
| Fort Keogh | 748.4 | 2367 |
| Horton | 757.7 | 2395 |
| Hathaway | 766.6 | 2428 |
| Rosebud | 777.8 | 2462 |
| Forsythe | 791.2 | 2514 |
| Howard | 801.6 | 2561 |
| Sanders | 812.0 | 2595 |
| Myers | 823.2 | 2659 |
| Big Horn | 833.6 | 2690 |
| Big Horn tunnel, grade | 837.4 | 2737 |
| Custer | 839.5 | 2727 |
| Riverside | 848.1 | 2779 |
| Bull Mountain Station | 856.1 | 2842 |
| Pompey's Pillar | 863.8 | 2871 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

| | From Duluth. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Clermont | 871.8 | 2950 |
| Huntley | 880.1 | 3014 |
| Yellowstone River, first crossing, low water | 891.0 | 3079 |
| Billings | 892.7 | 3117 |
| Laurel | 906.0 | 3255 |
| Park City | 915.7 | 3387 |
| Rapids | 928.7 | 3517 |
| Stillwater | 933.1 | 3572 |
| Merrill | 941.6 | 3657 |
| Reedpoint | 944.1 | 3687 |
| Yellowstone River, second crossing, low water | 944.7 | 3676 |
| Greycliff | 960.1 | 3847 |
| Big Timber | 973.9 | 4072 |
| Springdale | 987.7 | 4190 |
| Elton | 995.3 | 4282 |
| Mission | 999.7 | 4345 |
| Yellowstone River, third crossing, low water | 1007.0 | 4437 |
| Livingston, junction with Rocky Mountain Railroad of Montana (to Yellowstone National Park) | 1008.2 | 4487 |
| Ceal Spur | 1012.9 | 4737 |
| Muir | 1020.2 | 5502 |
| Big Belt Mountains, range summit | 1021.1 | 5837 |
| Same, tunnel, summit grade | 1021.1 | 5567 |
| Gordon | 1028.4 | 4907 |
| Bozeman | 1033.0 | 4754 |
| Belgrade | 1042.9 | 4437 |
| Hamilton, about | 1050.0 | 4242 |
| Moreland | 1052.1 | 4220 |
| Gallatin River, low water, about | 1056.0 | 4077 |
| Gallatin | 1061.5 | 4032 |
| Magpie | 1072.0 | 3981 |
| Painted Rock | 1079.2 | 3955 |
| Toston | 1088.6 | 3915 |
| Townsend | 1097.9 | 3811 |
| Missouri River, low water | 1099.0 | 3793 |
| Bedford | 1101.0 | 3-84 |
| Placer | 1113.0 | 4292 |
| Spokane summit, grade | 1115.6 | 4347 |
| Clasol | 1120.2 | 4125 |
| Prickly Pear Junction, with Helena and Jefferson County Railroad | 1126.3 | 3880 |
| Prickly Pear Creek, low water | 1128.0 | 3867 |
| Helena | 1131.2 | 3932 |
| Red Mountain Junction, Helena and Red Mountain Rail- road | 1133.1 | 3909 |
| Ten-Mile Creek, low water | 1135.0 | 3877 |
| Birdseye | 1138.9 | 4210 |
| Clough Junction, Helena and Northern Railroad | 1140.6 | 4315 |
| Butler | 1144.2 | 4727 |
| Mullan tunnel, summit grade | 1151.7 | 5550 |
| Rocky Mountains, summit of Mullan Pass | 1151.7 | 5-75 |
| Mullan | 1152.1 | 5532 |
| Elliston | 1160.3 | 5038 |
| Avon | 1169.0 | 4677 |
| Garrison, junction of Montana Union Railway | 1182.0 | 4317 |
| Butte City (Montana Union Railway) | 1233.0 | 5703 |
| Lloyd | 1183.3 | 4297 |
| Gold Creek, low water | 1189.7 | 4205 |
| Gold Creek Station | • 1190.6 | 4255 |
| Drummond, junction with Drummond and Phillipsburg Railroad | 1202.7 | 3945 |
| Bearmouth | 1215.1 | 3789 |
| Carlan | 1222.7 | 368 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

| | From Duluth. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Hellgate River, low water, 3,631; grade..... | 1226.4 | 3646 |
| Bonita | 1230.7 | 3566 |
| Wallace | 1238.5 | 3450 |
| Bonner | 1248.5 | 3297 |
| Big Blackfoot River, low water, 3,223; grade | 1249.0 | 3277 |
| Missoula River, first crossing, low water, 3,206; grade | 1250.5 | 3251 |
| Same, second crossing, low water, 3,191; grade | 1251.8 | 3231 |
| Missoula, junction with Missoula and Bitter Root Valley Railroad | 1255.5 | 3197 |
| De Smet | 1261.9 | 3215 |
| Evano (summit of Coriakan Defile Pass, grade) | 1272.1 | 3948 |
| Arlee | 1283.0 | 3059 |
| Jocko River, low water, 2,954; grade | 1284.5 | 2999 |
| Ravalli | 1292.5 | 2692 |
| Jocko | 1299.5 | 2509 |
| Duncan | 1306.5 | 2499 |
| Perma | 1314.5 | 2495 |
| Clark's Fork of Columbia River, first crossing, low water | 1317.2 | 2464 |
| (NOTE.—From here west the altitudes are from mean tide, Pacific Ocean, and are 2 feet above those coming from the east.) | | |
| Horse Plains | 1333.0 | 2463 |
| Eddy | 1347.5 | 2415 |
| Clark's Fork, second crossing, low water | 1362.5 | 2298 |
| Belknap | 1363.5 | 2405 |
| Trout Creek Station | 1350.5 | 2375 |
| Noxon | 1395.0 | 2186 |
| Heron | 1405.0 | 2261 |
| Cabinet | 1411.0 | 2187 |
| Clark's Fork, third crossing, low water | 1416.8 | 2065 |
| Clark's Fork Station | 1418.5 | 2086 |
| Hope | 1428.5 | 2108 |
| Mouth of Pack River, ordinary stage of water of Lake Pend d'Oreille | 1433.0 | 2062 |
| Lake Pend d'Oreille, lowest stage | 1418-1444.0 | 2059 |
| Sand Point | 1443.5 | 2100 |
| Algoma | 1449.5 | 2214 |
| Granite | 1466.7 | 2290 |
| Athol | 1471.5 | 2210 |
| Chilco | 1475.1 | 2450 |
| Idaho Line | 1495.0 | 2121 |
| Trent | 1503.9 | 1989 |
| Spokane River, low water | 1504.0 | 1925 |
| Spokane Falls | 1513.1 | 1910 |
| Hangman's Creek, low water | 1515.9 | 1793 |
| Marshall Junction, with Spokane and Palouse Railway | 1521.8 | 2134 |
| Stevens | 1539.8 | 2282 |
| Sprague | 1553.8 | 1908 |
| Harriaton | 1563.7 | 1950 |
| Ritzville | 1577.5 | 1825 |
| Lind | 1594.8 | 1363 |
| Palouse Junction, with Columbia and Palouse Railroad | 1622.6 | 858 |
| Eltopia | 1641.1 | 600 |
| Pasco Junction, Cascade division | 1658.0 | 385 |
| Ainsworth | 1660.8 | 351 |
| Snake River, ordinary low water | 1661.0 | 328 |
| Walla Junction, with Walla Walla and Dayton Line, Oregon Railway and Navigation Co | 1674.5 | 326 |
| Walla Walla | 1706.0 | 925 |
| Juniper | 1687.0 | 318 |
| Matilla Junction, with Pendleton and Baker City line, Oregon Railway and Navigation Co | 1702.0 | 302 |
| Walla River, low water | 1702.3 | 270 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

| | From Duluth. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Coyote..... | 1718·0 | 257 |
| Willows..... | 1738·0 | 234 |
| Alkali..... | 1747·0 | 232 |
| Quinn's..... | 1762·0 | 236 |
| Grant's..... | 1778·0 | 180 |
| Des Chutes River, low water..... | 1785·0 | 170 |
| Celilo..... | 1787·0 | 160 |
| The Dalles..... | 1800·0 | 106 |
| Mosier..... | 1816·0 | 100 |
| Hood River, low water..... | 1823·0 | 80 |
| Viento..... | 1831·0 | 104 |
| Bonneville..... | 1847·0 | 60 |
| Bridal Veil..... | 1860·0 | 46 |
| Sandy River, low water..... | 1871·0 | 30 |
| Troutdale..... | 1871·0 | 60 |
| Clarnie..... | 1879·0 | 214 |
| Portland..... | 1889·0 | 30 |
| Columbia City..... | 1920·0 | 90 |
| Columbia River, high tide..... | 1928-1929·0 | 17 |
| Kalama..... | 1929·2 | 33 |
| Castle Rock..... | 1950·0 | 83 |
| Winlock..... | 1965·8 | 328 |
| Newaukum River, low water..... | 1977·0 | 192 |
| Chehalis..... | 1979·3 | 204 |
| Centralia..... | 1983·2 | 207 |
| Tenino, junction with Olympia and Chehalis Valley Rail- road..... | 1995·0 | 315 |
| Des Chutes River, low water..... | 2001·0 | 325 |
| Yelm Prairie..... | 2008·6 | 387 |
| Nisqually River, low water..... | 2010·6 | 265 |
| Lakeview..... | 2025·3 | 324 |
| Tacoma..... | 2034·2 | 31 |

CASCADE DIVISION.

[From profile in the office of S. D. Mason, engineer, and Richard Relf, assistant engineer, St. Paul.]

The profile is referred to a datum plane 5·72 feet below mean sea level (as determined by the U. S. Coast Survey) in Commencement Bay, Tacoma; and therefore its altitudes have received in the following tabulation a uniform subtraction of 6 feet. With this change, the height of Pasco Junction is 1 foot above that determined in the survey of the main line.

| | From Duluth. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Pasco Junction..... | 1658·0 | 386 |
| Columbia River, low water (1887), 320; high water (1876), 348; grade on bridge..... | 1659·1 to 1659·6 | 364 |
| Kennewick..... | 1661·0 | 350 |
| Relief..... | 1666·9 | 565 |
| Badger (a summit of grade)..... | 1675·6 | 687 |
| Horseshoe Bend of Yakima River, water, 488; grade..... | 1682·2 | 522 |
| Kiona..... | 1685·1 | 499 |
| Bender..... | 1692·9 | 639 |
| Yakima River, water at ordinary low stage, $\frac{1}{4}$ mile east of Bender..... | 1692·4 | 544 |
| Same, 1 mile west of Bender..... | 1693·9 | 572 |
| Prosser..... | 1698·8 | 668 |
| Mabton..... | 1710·8 | 722 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

CASCADE DIVISION—Continued.

| | From Duluth. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Satus | 1718·8 | 680 |
| Toppenish Creek, bed, 704; grade | 1723·1 | 718 |
| Toppenish | 1729·3 | 763 |
| Simcoe | 1736·5 | 863 |
| Yakima | 1748·3 | 1069 |
| Natches River, low and high water, 1,080-1,086; grade .. | 1750·0 | 1100 |
| Yakima River, first crossing, low and high water, 1,120-1,127; grade | | |
| Selah | 1754·4 | 1149 |
| Yakima River, second crossing (at lower end of Big Cañon), bed, 1,189; water, 1,196; grade | 1755·5 | 1151 |
| Roza | 1760·9 | 1225 |
| Gibraltar Rock, cutting 57 feet; grade | 1764·2 | 1251 |
| Umtanum Creek, bed, 1,321; grade | 1771·7 | 1336 |
| Umtanum | 1772·1 | 1340 |
| Yakima River, third crossing (at upper end of Big Cañon), low and high water, 1,403-1,413; grade | 1772·8 | 1351 |
| Wilson Creek, bed, 1,410; high water, 1,418; grade | 1779·2 | 1426 |
| Thrall | 1779·4 | 1426 |
| Ellensburg | 1780·4 | 1437 |
| Yakima River, fourth crossing, bed, 1,605; grade | 1785·3 | 1513 |
| Thorp | 1791·5 | 1629 |
| Yakima River, fifth crossing, bed, 1,673; grade | 1794·0 | 1664 |
| Cañon (near the upper cañon of the Yakima) | 1796·3 | 1698 |
| Teanaway River, bed, 1,811; grade | 1801·8 | 1790 |
| Teanaway | 1804·9 | 1828 |
| Clealum | 1805·7 | 1839 |
| Clealum River, bed, 1,961; grade | 1809·8 | 1912 |
| Yakima River, sixth crossing, bed, 2,000; grade | 1813·8 | 1986 |
| Nelson's | 1815·8 | 2025 |
| Big Creek, bed, 2,088; grade | 1816·3 | 2032 |
| Easton | 1820·2 | 2104 |
| Tunnel, natural surface, 2,314; grade | 1823·2 | 2171 |
| Cabin Creek, bed, 2,217; grade | 1825·8 | 2234 |
| Martin | 1826·0 | 2237 |
| Stampede tunnel, east end, grade | 1830·8 | 2777 |
| Same, summit of grade | 1831·6 | 2839 |
| Same, west end, grade | 1832·5 | 2849 |
| Stampede pass, crossing the Cascade range | 1833·4 | 2812 |
| Stampede, engine house | 1832·5 | 3980 |
| Cole | 1833·9 | 2746 |
| Weston | 1838·4 | 2164 |
| (Level grade 1,500 feet each side of Weston.) | 1841·4 | 1854 |
| Green River at bend of loop of railroad 1 mile southeast of Weston, bed, 1,793; grade | | |
| Green River, bed, 1,568; grade | 1842·5 | 1809 |
| Hot Springs | 1847·2 | 1584 |
| Maywood (level grade here for 1,700 feet) | 1848·2 | 1544 |
| Eagle Gorge | 1853·1 | 1345 |
| Green River: | 1861·1 | 1088 |
| Low and high water, 1,048-1,056; grade | | |
| Low and high water, 1,004-1,009; grade | 1861·4 | 1074 |
| At eastern one of three bridges near together, low and high water, 895-904; grade | 1862·3 | 1039 |
| At western one of these bridges, low and high water, 875-885; grade | 1865·3 | 925 |
| Low and high water, 823-833; grade | 1865·6 | 917 |
| Lowest crossing, low and high water, 809-819; grade .. | 1867·4 | 846 |
| Palmer | 1867·6 | 846 |
| Enumclaw | 1868·7 | 874 |
| Boise Creek Station | 1877·6 | 734 |
| White River, bed, 615; grade | 1879·8 | 685 |
| | 1880·0 | 685 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

CASCADE DIVISION—Continued.

| | From Duluth. | Above the sea. |
|---|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Buckley | 1881.0 | 716 |
| Cascade | 1885.2 | 473 |
| South Prairie | 1886.0 | 423 |
| White River, low and high water, 142-146; grade | 1893.1 | 165 |
| Stuck Junction | 1894.4 | 100 |
| Stuck River, low and high water, 83-90; grade | 1895.0 | 101 |
| Alderton | 1898.9 | 65 |
| Puyallup River, low and high water, 48-60; grade | 1900.2 | 72 |
| Meeker | 1901.4 | 62 |
| Puyallup | 1902.7 | 45 |
| Clark's Creek, bed, 8; water, 12; grade | 1905.1 | 30 |
| Reservation | 1909.1 | 12 |
| Commencement Bay, depth of water at mean sea level, 10 feet; grade | 1910.8 to 1911.2 | 9 |
| Tacoma, top of wharf | 1911.7 | 10 |
| Lowest tide observed at Tacoma by U. S. Coast Survey, 1877, 10.5 feet below mean sea level. | | |
| Highest tide observed by Coast Survey, 1877, 5 feet above mean sea level. | | |
| Highest tide observed by D. D. Clark, 1884, 7 feet above mean sea level. | | |
| Extreme range between low and high tide, 17.5 feet. | | |

ST. PAUL AND NORTHERN PACIFIC RAILROAD.

(Operated by the Northern Pacific Railroad Company.)

MAIN LINE, ST. PAUL TO BRAINERD.

[From profile in the office of J. W. Kendrick, engineer, St. Paul.]

This profile has a discrepancy of 4½ feet at Little Falls, north of which place its figures are copied with a uniform addition of 1 foot, which makes them agree exactly with the corrected elevations of the Northern Pacific Railroad at Brainerd. From St. Paul to Little Falls it requires a uniform subtraction of 4½ feet, which is here made, giving agreement with connecting railways at St. Paul, Minneapolis, and St. Cloud.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. Paul, union depot | 0.0 | 703 |
| Mississippi street, grade | 1.6 | 784 |
| Como avenue, grade | 4.6 | 911 |
| Warrendale | 5.3 | 925 |
| Summit, cutting 2 feet; grade | 5.6 | 933 |
| Snelling avenue (Hamline) | 6.2 | 922 |
| St. Anthony Park Station (a summit of grade) | 8.0 | 904 |
| University avenue, Minneapolis | 9.4 | 827 |
| Mississippi River, at bridge of this railroad near the State University, bed, 716; low water, 720; top of St. Peter sandstone in both bluffs, 759; top of Trenton limestone in east bluff, 789, and in west bluff, 784; grade | 10.0 | 815 |
| Minneapolis, St. Paul, Minneapolis and Manitoba (union) depot; grade (3 feet above that of St. Paul, Minneapolis and Manitoba Railway) | 11.4 | 813 |
| Mississippi River at bridge of this railroad in the north part of Minneapolis, bed, 783; low and high water, 794-803; grade | 13.2 | 825 |
| Fridley | 17.4 | 847 |
| Summit, grade | 17.8 | 854 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

ST. PAUL AND NORTHERN PACIFIC RAILROAD—Continued.

MAIN LINE, ST. PAUL TO BRAINERD—continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Rice Creek, mill pond, bed, 812; water, 818; grade..... | 18.9 | 845 |
| Summit, grade..... | 22.4 | 881 |
| Coon Creek, bed, 824; water, 826; grade..... | 23.4 | 858 |
| Coon Creek Station..... | 25.0 | 867 |
| Anoka..... | 28.5 | 878 |
| Rum River, bed, 828; low and high water, 840-847; grade..... | 29.2 | 863 |
| Itasca..... | 35.6 | 885 |
| Elk River Station..... | 40.5 | 893 |
| Elk River, bed, 886; water, 893; grade..... | 45.5 | 909 |
| Bailey's..... | 46.1 | 913 |
| Big Lake Station..... | 49.4 | 935 |
| Becker..... | 57.5 | 972 |
| Clear Lake Station..... | 64.3 | 991 |
| Cable..... | 70.4 | 1012 |
| East St. Cloud..... | 75.5 | 1025 |
| Crossing St. Cloud and Hinckley branch, St. Paul, Min- neapolis and Manitoba Railway..... | 75.8 | 1025 |
| Sauk Rapids..... | 77.3 | 1005 |
| Mississippi River at the mouth of Sauk River..... | 77.3 | 988 |
| Summit, grade..... | 82.6 | 1058 |
| Watab..... | 83.0 | 1053 |
| Goodhue brook, grade on bridge..... | 85.1 | 1048 |
| Little Rock River, water, 1,007; grade..... | 86.3 | 1025 |
| Rice's..... | 90.2 | 1062 |
| Platte River, water, 1,059; grade..... | 95.9 | 1073 |
| Royalton..... | 96.8 | 1080 |
| Gregory..... | 102.6 | 1100 |
| Little Falls, junction of Little Falls and Dakota Rail- road..... | 107.6 | 1117 |
| Belle Prairie..... | 111.9 | 1132 |
| Topeka..... | 115.3 | 1143 |
| Summit, grade..... | 120.0 | 1175 |
| Fort Ripley..... | 120.9 | 1169 |
| Nokasippi River, bed, 1,134; low water, 1,139; grade.... | 121.9 | 1154 |
| Lenox..... | 126.3 | 1176 |
| Crow Wing..... | 130.2 | 1194 |
| Buffalo Creek, bed, 1,173; water, 1,175; grade..... | 134.0 | 1206 |
| Summit, cutting 6 feet; grade..... | 135.0 | 1234 |
| Buckhorn Creek, bed, 1,190; water, 1,192; grade..... | 136.5 | 1215 |
| Brainerd, junction with Northern Pacific Railroad..... | 137.9 | 1207 |
| Brainerd Station..... | 138.0 | 1209 |

LITTLE FALLS TO STAPLES' MILLS.

[From profile in the office of S. D. Mason, engineer, St. Paul.]

Agreement is exact with the corrected main lines at Little Falls and Staples' Mills.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Little Falls, main line..... | 107.6 | 1117 |
| Junction with Little Falls and Dakota Railroad close west of the Mississippi Bridge..... | 108.3 | 1112 |
| Darling..... | 112.3 | 1154 |
| South fork of Little Elk River, water, 1,160; grade..... | 117.7 | 1174 |
| Randall..... | 118.1 | 1178 |
| Relf..... | 123.3 | 1265 |
| Summit, cutting 18 feet; grade..... | 128.1 | 1333 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

ST. PAUL AND NORTHERN PACIFIC RAILROAD—Continued.

LITTLE FALLS TO STAPLES' MILLS—continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Depression at Fish Trap Lake, filling 11 feet; grade | 128.1 | 1286 |
| Fish Trap Lake, about 1,273; Lake Alexander, about 1,275. | | |
| Lincoln | 129.4 | 1281 |
| Fish Trap Creek, bed, 1,252; grade | 131.4 | 1269 |
| Summit, cutting 26 feet; grade | 133.3 | 1276 |
| Fish Trap Creek, bed, 1,237; grade | 135.3 | 1248 |
| Birdsall | 135.6 | 1245 |
| Long Prairie River, bed, 1,223; water, 1,227; grade | 135.9 | 1243 |
| Hayden Creek, bed, 1,234; grade | 140.5 | 1247 |
| Staples' Mills, junction with Northern Pacific Railroad, 143.8 miles from Duluth | 141.6 | 1274 |

LITTLE FALLS AND DAKOTA RAILROAD.

[Operated by Northern Pacific Railroad Company. From profile in the office of S. D. Mason, engineer, St. Paul.]

With changes here made as required by this profile to refer it to sea level at Little Falls and to join its three distinct series of leveling, it agrees with the connecting railways at Sauk Center, Glenwood, and Morris.

| | From Little Falls. | Above the sea. |
|--|--------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Little Falls, junction with St. Paul and Northern Pacific Railroad, 107.6 miles from St. Paul | 0.0 | 1117 |
| Mississippi River, bed, 1,096; low water, formerly, 1,090; water now raised by dam to 1,099; grade | 0.5 | 1112 |
| Pike Creek, bed, 1,106; grade | 3.8 | 1118 |
| Summit, cutting 4 feet; grade | 6.8 | 1198 |
| La Fond | 7.2 | 1186 |
| Summit, cutting 2 feet; grade | 9.2 | 1213 |
| Summit, cutting 1 foot; grade | 10.5 | 1214 |
| Milkie's Creek, bed, 1,174; grade | 11.0 | 1185 |
| Bain's Run, bed, 1,157; grade | 13.1 | 1166 |
| Irish Creek, bed, 1,154; grade | 13.7 | 1161 |
| Swan River, bed, 1,151; low water, 1,154; grade | 14.3 | 1164 |
| Swanville | 16.1 | 1173 |
| Summit, cutting 6 feet; grade | 17.0 | 1194 |
| Manley Creek, bed, 1,171; water, 1,173; grade | 18.0 | 1179 |
| Summit, cutting 23 feet; grade | 19.2 | 1261 |
| Hansen | 20.6 | 1270 |
| Summit, natural surface and grade the same | 20.8 | 1271 |
| Cogel (summit, natural surface and grade the same) | 22.6 | 1294 |
| Gray Eagle | 25.1 | 1225 |
| Prairie Brook, bed, 1,179; grade | 27.8 | 1194 |
| Birch Bark Lakes, water, about | 27.8 | 1177 |
| Brook, bed, 1,201; grade | 28.4 | 1221 |
| Birch Lake Station | 28.6 | 1229 |
| Summit, natural surface and grade | 29.7 | 1283 |
| Spaulding | 31.1 | 1294 |
| Summit, cutting 13 feet; grade | 32.6 | 1340 |
| Sauk River, bed, 1,214; low water, 1,221; grade | 36.7 | 1227 |
| Sauk Center | 37.6 | 1244 |
| Same, crossing St. Paul, Minneapolis and Manitoba Ry. ... | 37.8 | 1255 |
| Westport | 47.8 | 1334 |
| Ashley Creek, a half mile below Westport Lake, bed, 1,319; grade | 48.7 | 1331 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

LITTLE FALLS AND DAKOTA RAILROAD—Continued.

| | From Little Falls. | Above the sea. |
|--|--------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Villard | 52.7 | 1360 |
| Lakes Villard and Amelia, water | 54.2 | 1347 |
| Summit at crossing of the Minneapolis and Pacific Railway, natural surface and grade | 59.2 | 1415 |
| Glenwood | 59.6 | 1403 |
| Rue's Run, bed, 1,262; grade | 61.7 | 1299 |
| Trapper's Run, near Pelican Lake, bed, 1,145; grade | 64.2 | 1171 |
| Lake Whipple (formerly called White Bear Lake and recently Lake Minnewaska), low and high water | 67.1 | 1133-1137 |
| Water tank, grade | 68.3 | 1159 |
| Starbuck | 68.5 | 1161 |
| Little Chippewa River, bed, 1,149; grade | 72.7 | 1157 |
| Summit, cutting 4 feet; grade | 74.6 | 1185 |
| Chippewa River, bed, 1,110; grade | 78.3 | 1124 |
| Cyrus | 78.7 | 1142 |
| Summit, cutting 1 foot; grade | 82.4 | 1191 |
| Pomme de Terre River, bed, 1,074; grade | 86.0 | 1087 |
| Morris | 87.9 | 1129 |

NORTHERN PACIFIC, FERGUS AND BLACK HILLS RAILROAD.

[Operated by Northern Pacific Railroad Company. From profile in the office of S. D. Mason, engineer, St. Paul.]

The elevations given by the profile receive here a uniform addition of 2 feet, like the Northern Pacific Railroad. Intersecting railways at Fergus Falls, Breckenridge, and Wahpeton show exact agreement.

| | From Wadena. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Wadena Junction, Northern Pacific Railroad, 162.9 miles from Duluth | 1.9 | 1352 |
| Oak Creek, bed, 1,336; grade | 3.3 | 1349 |
| Bluff Creek, bed, 1,325; grade | 5.4 | 1355 |
| Deer Creek, bed, 1,380; grade | 10.0 | 1391 |
| Deer Creek Station | 10.3 | 1396 |
| Summit, cutting 5 feet; grade | 12.3 | 1421 |
| Rock Creek, bed, 1,395; grade | 12.7 | 1411 |
| Summit, grade | 13.1 | 1426 |
| Parkton | 13.9 | 1396 |
| Willow Creek, bed, 1,408; grade | 17.4 | 1422 |
| Henning | 18.0 | 1439 |
| Pease Prairie, general surface | 19-21 | 1452 |
| East Battle Creek, bed, 1,371; grade | 23.6 | 1382 |
| Vining | 24.1 | 1391 |
| Clitherall | 29.1 | 1346 |
| Summit, grade | 29.7 | 1370 |
| Outlet of Lake Clitherall, bed, 1,333; grade | 31.3 | 1342 |
| Lake Clitherall, water | 29-31 | 1334 |
| Battle Lake Station | 33.3 | 1356 |
| Outlet of Turtle Lake, bed, 1,329; grade | 36.7 | 1341 |
| Turtle Lake, low and high water | 36.7 | 1325-1330 |
| Maplewood (station discontinued) | 38.9 | 1362 |
| Underwood | 41.3 | 1345 |
| Outlet of Bass Lake, bed, 1,329; grade | 42.1 | 1337 |
| Bass Lake, low and high water | 42.1 | 1327-1330 |
| Wall Lake Station | 45.8 | 1292 |
| Red River, bed, 1,230; water, 1,233; grade | 46.9 | 1248 |
| Mill Park | 49.1 | 1225 |
| Red River, bed, 1,193; grade | 50.1 | 1206 |
| Pelican Junction | 51.0 | 1189 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

NORTHERN PACIFIC, FERGUS AND BLACK HILLS RAILROAD—Continued.

| | From Wadena. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Crossing St. Paul, Minneapolis and Manitoba Railway.. | 51.2 | 1194 |
| Fergus Falls..... | 51.9 | 1185 |
| Red River, bed, 1,147; water (in lowest millpond), 1,156; grade..... | 52.2 | 1177 |
| Pelican River, bed, 1,122; water, 1,124; grade..... | 56.0 | 1135 |
| Summit, grade..... | 56.5 | 1177 |
| French..... | 58.2 | 1087 |
| Upper or Herman Beach of Lake Agassiz, crest, 1,082; grade..... | 60.0 | 1077 |
| (This beach ridge is about 40 rods wide (including the slopes), and rises 10 feet above its base on each side.) | | |
| Ames (station discontinued)..... | 60.6 | 1065 |
| Everdell..... | 68.4 | 994 |
| Watosco..... | 71.3 | 980 |
| Red River, bed, 956; grade..... | 74.6 | 971 |
| Breckenridge..... | 76.9 | 962 |
| Bois des Sioux River, bed, 944; water, 945; grade..... | 77.2 | 962 |
| Wahpeton..... | 78.0 | 965 |
| Wild Rice River, bed, 937; water, 940; grade..... | 82.6 | 959 |
| Farmington..... | 84.9 | 962 |
| Antelope Creek, grade..... | 86.5 | 960 |
| Fairview..... | 88.4 | 967 |
| Mooreton..... | 90.8 | 969 |
| McCauleyville Beach of Lake Agassiz, crest, 974; grade. (This beach ridge is about 30 rods wide; its crest is 8 feet above its east base and 3 feet above its west base.) | 91.1 | 975 |
| Barney..... | 96.9 | 1033 |
| Wyndmere..... | 103.8 | 1062 |
| Herman Beach, crest, 1,067; grade..... | 105.3 | 1066 |
| (This beach ridge is 50 rods wide (including the slopes), and rises 8 feet above the land on each side.) | | |
| Thence westward the surface is very nearly level for about 8 miles..... | 105.4-113.2 | 1062-1066 |
| De Lamere..... | 112.5 | 1066 |
| Milnor Beach, crest and grade the same..... | 116.0 | 1085 |
| Second (upper) Milnor Beach, crest and grade the same.. (Each of these beach ridges is about 20 rods wide and 4 to 6 feet high.) | 116.3 | 1086 |
| Milnor..... | 119.0 | 1097 |

DULUTH AND MANITOBA RAILROAD.

(Operated by Northern Pacific Railroad Company.)

[From profile in the offices of J. B. Holmes, president, Minneapolis, and S. D. Mason, engineer, St. Paul].

The elevations from Winnipeg Junction to Fertile are copied without change. Close north of Fertile a discrepancy in the profile requires a subtraction of 10½ feet from its elevations thence northward. With this correction, the elevations obtained by this survey at Grand Forks and Pembina are 2 feet higher than by the St. Paul, Minneapolis and Manitoba Railway west of the Red River, and by the United States Engineer Corps in their survey of this river; but they would be 4 feet higher if a uniform addition of 2 feet were made, as required to bring this profile into accord with the Northern Pacific Railroad. The addition of 2 feet is therefore omitted; and the corrected profile is harmonized with the United States engineers' surveys along the Red River by subtracting 2½ feet from it (i. e., 13 feet from the original profile) at Red Lake Falls and uniformly thence northward to Pembina and the international boundary.

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

DULUTH AND MANITOBA RAILROAD—Continued.

| | From Winni- peg Junction. | Above the sea. |
|--|------------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Winnipeg Junction, Northern Pacific Railroad, 226-6 miles from Duluth..... | 0-0 | 1181 |
| Buffalo River, bed, 1,150; grade..... | 0-5 | 1172 |
| Summit, natural surface and grade..... | 5-8 | 1253 |
| Ulen | 13-0 | 1154 |
| South Branch of Wild Rice River, bed, 1,113; grade..... | 13-6 | 1135 |
| Upper or Herman Beach of Lake Agassiz, crest, 1,141; grade..... | 18-6 | 1135 |
| (Descent south from crest in 12 rods, 9 feet; descent north in 12 rods, 6 feet.) | | |
| Twin Valley | 25-8 | 1093 |
| Wild Rice River, bed, about 985; grade..... | 27-8 | 1010 |
| Norman | 33-9 | 1099 |
| Herman Beach, crest, 1,156; grade | 43-7 | 1151 |
| Sand Hill River, bed, 1,075; grade..... | 44-5 | 1115 |
| Fertile | 45-5 | 1140 |
| Kittelson Creek, bed, 1,094; grade | 49-1 | 1124 |
| Herman (b) Beach, crest | 49-3-50-0 | 1152-1155 |
| Herman (d) Beach, three places, crest, 1,118-1,119; grade..... | 57-0-57-8 | 1116-1117 |
| Crossing the Fosston branch of the St. Paul, Minneapolis and Manitoba Railway | 57-1 | 1116 |
| Tilden | 57-3 | 1116 |
| Norcross Beach, crest and grade..... | 61-3-61-6 | 1101 |
| Tributary of Badger Creek, 1,033; grade | 64-9 | 1045 |
| Red Lake Falls, junction of spur track to station..... | 68-7 | 1036 |
| Red Lake Falls station, 0-6 mile from the main line..... | 69-3 | 1035 |
| Red Lake River, bed, 932; grade..... | 70-6 | 964 |
| Summit, cutting 9 feet; grade | 73-0 | 1011 |
| Black River, bed, 939; grade | 75-9 | 974 |
| McCauleyville Beach, crest and grade..... | 76-6-77-8 | 993-992 |
| Crossing the St. Hilaire branch of the St. Paul, Minneapolis and Manitoba Railway | 78-3 | 977 |
| Beach, crest and grade..... | 80-7 | 962-961 |
| Beach, crest and grade | 81-4 | 954 |
| Beach, crest and grade..... | 82-1 | 946 |
| South Euclid, crossing the St. Vincent line of the St. Paul, Minneapolis and Manitoba Railway..... | 86-0 | 901 |
| Buffington | 90-0 | 872 |
| Junction of spur track to Keystone | 93-3 | 855 |
| Lowest portions of this spur track..... | 94-6-95-9 | 853 |
| Keystone | 96-3 | 855 |
| Grand Marais Slough (former channel of Red Lake River), bed, 813; grade | 101-6 | 828 |
| East Grand Forks..... | 104-7 | 831 |
| End of spur to river, East Grand Forks..... | 105-1 | 807 |
| Red River, bed, 779; extreme low and high water, 784-828; grade..... | 104-9 | 831 |
| Grand Forks | 105-4 | 834 |
| Slough, bed, 807; grade..... | 107-3 | 828 |
| Salt River, bed, 817; grade..... | 114-1 | 836 |
| Kelley's | 115-9 | 842 |
| Salt Cooley, bed, 823; grade..... | 116-6 | 835 |
| Meckinock | 122-1 | 861 |
| Turtle River, bed, 854; grade..... | 122-9 | 865 |
| Bean's | 127-3 | 893 |
| Gilby | 130-9 | 879 |
| Johnstown | 135-3 | 871 |
| Forest River Station | 140-3 | 862 |
| Forest River, bed, 847; grade | 141-1 | 859 |
| Voss | 145-5 | 842 |
| Crossing the Neche line of the St. Paul, Minneapolis and Manitoba Railway..... | 153-7 | 826 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

DULUTH AND MANITOBA RAILROAD—Continued.

| | From Winni- peg Junction. | Above the sea. |
|--|------------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Grafton..... | 154·6 | 824 |
| Park River, bed, 803; grade..... | 155·0 | 822 |
| Cashel..... | 161·9 | 804 |
| Drayton..... | 170·1 | 798 |
| Bowesmont..... | 179·1 | 791 |
| Joliette..... | 188·6 | 794 |
| Pembina River, ordinary stage of water, 757; grade.... | 198·2 | 785 |
| Pembina..... | 199·1 | 789 |
| Grade on the international boundary..... | 201·5 | 789 |

FARGO AND SOUTHWESTERN RAILROAD.

(Operated by Northern Pacific Railroad Company.)

[From profile in the office of S. D. Mason, engineer, St. Paul.]

An addition of 2 feet is made here, as on the Northern Pacific Railroad. It agrees at La Moure with the James River Valley Railroad, and at Edgeley with the Chicago, Milwaukee and St. Paul Railway.

| | From Fargo. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Junction with Northern Pacific Railroad, near Fargo, 253·7 miles from Duluth..... | 1·2 | 905 |
| Cotter's..... | 4·2 | 911 |
| Horace..... | 10·7 | 919 |
| Sheyenne River, bed, 897; grade..... | 12·3 | 923 |
| Warren..... | 16·1 | 926 |
| Davenport, crossing the St. Paul, Minneapolis and Man- itoba Railway..... | 19·1 | 923 |
| Woods..... | 25·3 | 952 |
| Lower Tintah Beach of Lake Agassiz, crest, 1,014; grade. (This beach ridge is bordered on its east side by a gradual slow descent, and on the west side by a depression 7 feet below its crest, 15 rods distant. Small beach ridges appear also 500 and 800 feet west from this depression, their crests being at 1,016 and 1,017 feet; grade at these points is 1,018 and 1,021.) | 27·8 | 1010 |
| Upper Tintah Beach or shore of Lake Agassiz, the sum- mit of a comparatively steep ascent from the east, with a gentler ascent thence westward, escarpment crest, 1,034; grade..... | 28·2 | 1029 |
| Leonard..... | 28·7 | 1047 |
| (Norcross Beaches, three, at 32·0, 32·3, and 32·7 miles; crests, 1,062, 1,062, and 1,065 feet. The last is only 18 rods wide; the depression on its east side is 6 feet, and on the west 5 feet.) | | |
| Depression, apparently an ancient water-course, 800 feet wide, 6 feet below the land on each side (but eastward a gradual descent begins within 500 feet), bottom, 1,064; grade..... | 40·15-40·3 | 1070 |
| Sheldon..... | 41·5 | 1080 |
| Natural surface, 1,122; grade..... | 45·1 | 1119 |
| Buttzeville..... | 50·4 | 1173 |
| Summit, cutting 1 foot; grade..... | 51·0 | 1190 |
| Top of left (eastern) bluff of the Sheyenne River, natural surface and grade the same..... | 54·0 | 1187 |
| (Thence the grade descends rapidly westward, with frequent cuts and fills of 15 to 35 feet.) | | |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

FARGO AND SOUTHWESTERN RAILROAD—Continued.

| | From Fargo. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Sheyenne River, bed, 1,064; grade..... | 55.8 | 1092 |
| Lisbon..... | 56.0 | 1091 |
| Elliott..... | 63.0 | 1310 |
| Summit, cutting 3 feet; grade..... | 65.5 | 1408 |
| Marshall..... | 68.5 | 1343 |
| Summit, natural surface and grade the same..... | 71.7 | 1385 |
| Bear Creek, bed, 1,328; water, 1,333; grade..... | 74.3 | 1352 |
| Verona..... | 76.5 | 1387 |
| Valley Junction, James River Valley railroad..... | 82.7 | 1403 |
| La Moure, junction with James River Valley railroad.... | 88.0 | 1307 |
| James River, bed, 1,289; grade..... | 88.4 | 1307 |
| Notes of the continuation of this railroad from La Moure to Edgeley, under the name of the Northern Pacific, La Moure and Missouri River Railroad, are as follows: | | |
| Berlin..... | 98.0 | 1470 |
| Medbery..... | 104.1 | 1522 |
| Crossing the Chicago, Milwaukee and St. Paul Railway.. | 108.9 | 1553 |
| Edgeley..... | 109.4 | 1568 |

JAMES RIVER VALLEY RAILROAD.

(Operated by Northern Pacific Railroad Company.)

(From profile in the office of S. D. Mason, engineer, St. Paul.)

This agrees at Jamestown with the Northern Pacific Railroad and at La Moure and Valley Junction with the Fargo and Southwestern Railroad.

| | From James-town. | Above the sea. |
|--|------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Jamestown, junction with the Northern Pacific Railroad, 345.5 miles from Duluth..... | 0.0 | 1408 |
| James River, first crossing, bed, 1,361; grade..... | 5.3 | 1379 |
| Summit, natural surface and grade..... | 6.7 | 1403 |
| James River, second crossing, bed, 1,350; grade..... | 9.8 | 1370 |
| Summit, natural surface and grade..... | 12.2 | 1388 |
| Ypsilanti..... | 12.8 | 1381 |
| Gravel pit, grade..... | 13.1-13.4 | 1375 |
| James River, third crossing, bed, 1,342; grade..... | 14.0 | 1364 |
| Same, fourth crossing, bed, 1,334; grade..... | 18.1 | 1357 |
| Montpelier..... | 18.9 | 1358 |
| Line between Stutsman and La Moure Counties, natural surface and grade..... | 23.9 | 1352 |
| Adrian..... | 26.2 | 1355 |
| James River, fifth crossing, bed, 1,315; grade..... | 30.1 | 1336 |
| Dickey..... | 32.5 | 1360 |
| James River, sixth crossing, bed, 1,305; grade..... | 35.8 | 1327 |
| Same, seventh crossing, bed, 1,298; grade..... | 39.2 | 1320 |
| Grand Rapids..... | 41.1 | 1321 |
| James River, eighth crossing, bed, 1,293; grade..... | 45.6 | 1310 |
| Same, ninth crossing, bed, 1,290; grade..... | 47.5 | 1307 |
| West La Moure..... | 48.1 | 1305 |
| James River, tenth crossing, bed, 1,289; grade..... | 48.3 | 1307 |
| La Moure, junction with Fargo and Southwestern R. R.. | 48.7 | 1307 |
| Valley Junction, Fargo and Southwestern R. R..... | 54.0 | 1403 |
| Glover..... | 61.7 | 1373 |
| Bear Creek, bed, 1,287; grade..... | 67.6 | 1303 |
| Oakes, connection with the Chicago and Northwestern Railway..... | 69.1 | 1313 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

SANBORN, COOPERSTOWN AND TURTLE MOUNTAIN RAILROAD.

(Operated by Northern Pacific Railroad Company.)

[From profile in the office of S. D. Mason, engineer, St. Paul.]

With addition of 2 feet, as on the Northern Pacific Railroad.

| | From Sanborn. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Sanborn, junction with Northern Pacific Railroad, 322·0 miles from Duluth..... | 0·0 | 1444 |
| Odell | 9·0 | 1426 |
| Dazey | 18·0 | 1433 |
| Hannaford..... | 27·5 | 1382 |
| Cooperstown..... | 36·5 | 1428 |

JAMESTOWN AND NORTHERN RAILROAD.

(Operated by Northern Pacific Railroad Company.)

[From profile in the office of S. D. Mason, engineer, St. Paul.]

With addition of 2 feet, as on the Northern Pacific Railroad. It agrees at Devil's Lake with the St. Paul, Minneapolis and Manitoba Railway.

| | From James-town. | Above the sea. |
|--|------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Junction with Northern Pacific Railroad 1 mile west of Jamestown, 346·5 miles from Duluth..... | 1·0 | 1399 |
| Pipestem Creek, bed, 1,388; grade | 1·6 | 1405 |
| Same, bed, 1,394; grade | 2·6 | 1410 |
| Parkhurst | 6·5 | 1502 |
| Buchanan | 13·5 | 1548 |
| Pingree | 21·1 | 1550 |
| Edmunds | 27·6 | 1597 |
| Melville | 34·5 | 1603 |
| Carrington..... | 43·5 | 1584 |
| Junction of branch to Sykeston..... | 44·0 | 1586 |
| Barlow | 50·8 | 1545 |
| New Rockford..... | 59·5 | 1531 |
| James River, bed, 1,499; water, 1,502; grade | 60·0 | 1516 |
| Summit, natural surface and grade the same | 66·0 | 1611 |
| Sheyenne | 70·6 | 1480 |
| Sheyenne River, bed, 1,409; water, 1,410; grade..... | 72·1 | 1423 |
| Oberon | 79·3 | 1559 |
| Fort Totten Station | 83·2 | 1566 |
| Minnewaukan..... | 90·1 | 1461 |
| Devil's Lake, water Aug. 10, 1887..... | 90·1 | 1431·5 |
| Same, lowest and highest stages during years 1880 to 1889 | 90·1 | 1430-1434 |
| BRANCH TO SYKESTON. | | |
| Junction with the preceding, near Carrington..... | 44·0 | 1586 |
| Pipestem Creek, bed, 1,562; water, 1,563; grade..... | 50·0 | 1582 |
| Ross | 50·5 | 1591 |
| Sykeston..... | 57·0 | 1628 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

ROCKY MOUNTAIN RAILROAD OF MONTANA

(TO THE YELLOWSTONE NATIONAL PARK.)

[NOTE.—This and the following lines are operated by the Northern Pacific Railroad Company, and are copied from profiles in the office of S. D. Mason, engineer, St. Paul. Two feet are added uniformly to them all, as on the Northern Pacific Railroad.]

| | From Living- ston. | Above the sea. |
|---|-----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Livingston, junction with the Northern Pacific Railroad, 1,008.2 miles from Duluth | 0.0 | 4487 |
| Brisbin | 10.0 | 4682 |
| Trail Creek Station | 14.2 | 4822 |
| Chicory | 20.0 | 4847 |
| Emigrant | 23.0 | 4862 |
| Dailey's | 30.5 | 4915 |
| Sphinx | 41.2 | 5072 |
| Cinnabar | 51.0 | 5172 |

HELENA AND JEFFERSON COUNTY RAILROAD.

| | From Prickly Pear Junction. | Above the sea. |
|---|--------------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Prickly Pear Junction, with Northern Pacific Railroad, 1,126.3 miles from Duluth | 0.0 | 3889 |
| Clancy | 9.7 | 4317 |
| Jefferson Junction, with Helena, Boulder Valley and Butte Railroad | 15.2 | 4515 |
| Jefferson | 15.5 | 4537 |
| Corbin | 17.3 | 4752 |
| Wickes | 20.0 | 5152 |

HELENA, BOULDER VALLEY AND BUTTE RAILROAD (BRANCH FROM THE LAST).

| | From Jefferson Junction. | Above the sea. |
|---|-----------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Jefferson Junction | 0.0 | 4515 |
| Hodgson | 3.0 | 4858 |
| Boulder Pass, summit, 5,715; grade in tunnel (192 feet long) | 8.6 | 5662 |
| Boulder City | 17.0 | 4920 |
| Cataract | 24.6 | 5274 |
| Calvin | 30.0 | 5556 |

HELENA AND RED MOUNTAIN RAILROAD.

| | From Helena. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Helena, 1,131.2 miles from Duluth | 0.0 | 3932 |
| Red Mountain Junction, with Northern Pacific Railroad. | 1.9 | 3909 |
| Kessler's | 3.2 | 3930 |
| Thermal Springs | 4.7 | 4027 |
| Gold Bar | 11.0 | 4490 |
| Moose Creek Station | 14.1 | 4831 |
| <i>Rimini</i> | 16.9 | 5183 |

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

HELENA AND NORTHERN RAILROAD.

| | From Clough Junction. | Above the sea. |
|---|-----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Clough Junction, with Northern Pacific Railroad, 1,140·6 miles from Duluth..... | 0·0 | 4315 |
| Cruse | 6·4 | 4585 |
| Marysville | 12·4 | 5376 |

DRUMMOND AND PHILLIPSBURG RAILROAD.

| | From Drummond. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Drummond, junction with Northern Pacific Railroad, 1,202·7 miles from Duluth..... | 0·0 | 3945 |
| New Chicago..... | 2·9 | 4037 |
| Stone | 12·3 | 4539 |
| Flint..... | 15·7 | 4834 |
| Phillipsburg | 25·8 | 5167 |

MISSOULA AND BITTER ROOT VALLEY RAILROAD.

| | From Missoula. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Missoula, junction with Northern Pacific Railroad, 1,255·5 miles from Duluth..... | 0·0 | 3197 |
| Missoula River, low water, 3,159; grade | 0·5 | 3178 |
| Bitter Root River, low water, 3,112; grade..... | 4·4 | 3132 |
| Lou Lou | 11·0 | 3175 |
| Florence | 20·0 | 3249 |
| Stevensville..... | 27·7 | 3299 |
| Victor | 35·5 | 3391 |
| Corvallis..... | 44·0 | 3474 |

CANADIAN PACIFIC RAILWAY SYSTEM.

A published profile of this railway gives the elevation of Lake Superior as 598 feet above the sea, while on the profiles in the engineers' offices it is shown as 600 feet. Assuming the mean of these figures to represent the mean lake level, a uniform addition of 3 feet is here made to the eastern part of the profile, extending from Port Arthur to Eagle River Station, to accord approximately with the mean elevation of Lake Superior, 601·56 feet, determined by the engineers of the United States Lake Survey.

The profile shows a discrepancy of 8 feet close west of Eagle River Station, 232 miles west of Port Arthur, on account of which its elevations thence west to Cross Lake require a subtraction of 5 feet, which is here made, to agree with the foregoing. Again at Cross Lake, 334·4 miles west of Port Arthur, a discrepancy of 5 feet to be added is found in the profile, so that its original elevations thence west to the Red River and south to Emerson are here copied without change, being in accord with the corrected profile on the east.

The main line from East Selkirk to the junction of the Emerson branch, close east of Winnipeg, and this branch, extending from St. Boniface to the international boundary, are supplied by Collingwood Schreiber, chief engineer and general manager of the Canadian government railways, and are on the same system of leveling with the main line from Port Arthur to East Selkirk, which, however, is subject to the slight adjustments mentioned. This whole series thus adjusted is surely correct within very close approximation, as is shown by its exact agreement at Emerson with the St. Paul, Minneapolis and Manitoba Railway, and with leveling by the United States Engineer Corps along the Red River of the North.

Two smaller discrepancies also appear in this profile, but are here neglected. At 117 miles from Port Arthur (close west of Scott's River), and thence west, a subtraction of 2 feet is indicated; and at 256.5 miles (close west of Parrywood), and thence west, a subtraction of 1 foot. If these were taken into account the west part of this profile would be lowered 3 feet; but it seems more probable that it should agree with the elevation of Emerson, determined by surveys in the United States.

A large discrepancy is found between this eastern system of leveling and that which begins at Winnipeg and extends west to the Rocky Mountains. The latter includes the branches west of the Red River at Winnipeg and westward, also the Manitoba and Northwestern Railway and its branches, which refer their elevations to that of the Canadian Pacific profile at Portage la Prairie. The system east of the Red River is reliable, as already stated; and leveling from St. Boniface Station (754) to the Louise Bridge (752, instead of 728 on the profile extending westward) shows that the system west of the Red River requires a uniform addition of 24 feet, which is here made in these lists of altitudes at Winnipeg and thence west. With this correction, the Southwestern branch from Winnipeg to Gretna agrees with the St. Paul, Minneapolis and Manitoba Railway at the international boundary; the survey from this branch at Rosenfeld to Emerson agrees with the Emerson branch; and the West Selkirk branch agrees with the main line east of the Red River.

MAIN LINE, FROM PORT ARTHUR TO WINNIPEG.

[Between Port Arthur and East Selkirk, from profiles in the offices of P. A. Peterson, engineer, Montreal, and R. M. Pratt, engineer, Winnipeg; and between East Selkirk and Winnipeg from Collingwood Schreiber, engineer of Government railways, Ottawa.]

| | From Port Arthur. | Above the sea. |
|--|----------------------|----------------|
| | Miles. | Feet. |
| Lake Superior, mean, 1871-1887 | 0.0 | 601.56 |
| Port Arthur (a summit of grade), 993.0 miles from Mon- treal | 0.0 | 628 |
| McIntyre or Second River, water, 603; grade | 6.0 | 610 |
| Neebing or First River, water, 603; grade | 6.2 | 610 |
| Fort William | 7.0 | 615 |
| (Kaministiquia River here, $1\frac{1}{2}$ miles above its mouth, bed, 586; low water (1879), 600; high water (1859), 612.) | | |
| Fort William West (station disused) | 10.0 | 635 |
| (Kaministiquia River here, bed, 584; low and high water, 602-614.) | | |
| Murillo | 17.6 | 947 |
| Summit, grade (2 feet above natural surface) | 20.6 | 1080 |
| Lofoden | 20.8 | 1078 |
| Depression, filling 7 feet; grade | 21.8 | 1055 |
| Summit, cutting 2 feet; grade | 22.3 | 1081 |
| Strawberry Creek, bed, 987; low and high water, 990- 993; grade | 27.3 | 1002 |
| Kaministiquia | 27.9 | 1013 |
| Kaministiquia River, bed, 973; low and high water, 982- 996; grade | 28.2 | 1013 |
| Mattawan River, bed, 1,078; low and high water, 1,082- 1,039; grade | 32.4 | 1099 |
| Sunshine Creek, first crossing, bed, 1,106; low and high water, 1,109-1,113; grade | 33.9 | 1122 |
| Same, third crossing, bed, 1,151; low and high water, 1,158-1,162; grade | 35.5 | 1168 |
| Finmark | 37.1 | 1180 |
| Sunshine Creek, bed, 1,330; water, 1,334; grade | 41.3 | 1352 |
| Buda (a summit, natural surface and grade the same) .. | 44.4 | 1473 |
| Oskondiga River, bed, 1,415; water, 1,421; grade | 45.3 | 1453 |
| Tunnel, grade, 51 feet below top of rock above | 46.1 | 1458 |
| Oskondiga River, bed, 1,426; water, 1,428; grade | 52.2 | 1441 |
| Nordland | 55.5 | 1543 |
| Summit, natural surface and grade | 57.8 | 1584 |
| Southeast branch of Savanne River, bed, 1544; water, 1545; grade | 59.9 | 1554 |
| Same, bed, 1,537; water, 1,538; grade | 62.0 | 1546 |
| Linkooping | 65.2 | 1534 |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM PORT ARTHUR TO WINNIPEG—Continued.

| | From Port Arthur. | Above the sea. |
|---|----------------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Savanne | 75·8 | 1506 |
| North branch of Savanne River, bed, 1,487; water, 1,489; grade | 76·4 | 1506 |
| Upsala | 86·2 | 1579 |
| Carlstad | 93·6 | 1515 |
| Fire-steel River, bed, 1500; water, 1,505; grade | 98·5 | 1513 |
| Beaver River, bed, 1,519; water, 1,525; grade | 102·2 | 1532 |
| Bridge River Station | 103·6 | 1543 |
| Hawk Lake, water, 1,509; grade | 113·6 | 1518 |
| English River, bed, 1,504; water, 1,510; grade | 115·2 | 1515 |
| English River Station | 116·0 | 1517 |
| Scott's River, bed, 1,505; water, 1,511; grade | 116·6 | 1516 |
| Summit, cutting 11 feet; grade | 123·6 | 1558 |
| Martin | 124·0 | 1557 |
| Depression, grade | 127·4 | 1483 |
| Summit, grade | 131·6 | 1549 |
| Bonheur | 134·0 | 1530 |
| Summit, grade | 136·4 | 1554 |
| South Lake, water, 1,495; grade | 138·3 | 1510 |
| Depression, grade | 139·7 | 1478 |
| Gull River, bed, 1,456; grade | 143·7 | 1490 |
| Falcon | 144·8 | 1509 |
| Abgimac River, bed, 1,470; grade | 151·3 | 1490 |
| Ignace | 152·3 | 1487 |
| Osaguan River, bed, 1,398; grade | 158·7 | 1420 |
| Butler | 160·5 | 1423 |
| Little Wabigoon River, bed, 1,398; grade | 165·7 | 1408 |
| Glencoe River, bed, 1,398; grade | 167·0 | 1405 |
| Raleigh | 170·4 | 1440 |
| Little Wabigoon River, bed, 1,350; grade | 190·0 | 1366 |
| Taché | 180·2 | 1366 |
| Burnt Stick Creek, bed, 1,314; grade | 182·5 | 1347 |
| Kirkpatrick Creek, bed, 1,320; grade | 183·9 | 1352 |
| Bear Creek, bed, 1,333; grade | 186·6 | 1348 |
| Brulé | 190·4 | 1355 |
| McHugh's Creek, bed, 1,207; grade | 198·6 | 1235 |
| Summit, grade | 200·4-200·8 | 1255 |
| Hughes River, bed, 1,198; grade | 202·2 | 1211 |
| Wabigoon | 202·6 | 1211 |
| Blackwater Creek, bed, 1,200; grade | 204·5 | 1211 |
| Thunder Creek, bed, 1,205; grade | 206·1 | 1225 |
| Barclay | 209·8 | 1251 |
| Summit, cutting 10 feet; grade | 211·5 | 1267 |
| Wabigoon River, bed, 1,178; grade | 215·4 | 1219 |
| Shoshogawae River, bed, 1,151; grade | 220·8 | 1159 |
| Oxdrift | 221·8 | 1162 |
| Beaver River, first crossing, bed, 1,129; grade | 225·8 | 1149 |
| Same, second crossing, bed, 1,125; grade | 226·4 | 1139 |
| Same, third crossing, bed, 1,123; grade | 229·4 | 1153 |
| Eagle River Station | 231·8 | 1186 |
| Eagle River, bed, 1,148; grade | 232·2 | 1190 |
| Summit, cutting 7 feet; grade | 234·9 | 1278 |
| Vermilion Bay Station | 242·0 | 1221 |
| Grass Creek, bed, 1,183; grade | 242·5 | 1213 |
| Eagle Lake, water, about 1,182; grade | 246·9 | 1210 |
| Gilbert | 249·8 | 1217 |
| Muskrat Lake, water, about 1,174; grade | 251·0 | 1206 |
| Summit, natural surface and grade | 255·4 | 1295 |
| Parrywood | 256·3 | 1292 |
| Stewart Lake, water, 1,303; grade | 258·3 | 1328 |
| Summit near Forest Lake, natural surface and grade | 259·8 | 1382 |
| Outlet of Swan Lake, bed, 1,332; grade | 260·8 | 1382 |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM PORT ARTHUR TO WINNIPEG—Continued.

| | From Port Arthur. | Above the sea. |
|---|----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Parrywood Lake, water, about 1,362; grade (a summit) .. | 262.1 | 1379 |
| Outlet of Ulverston Lake, bed, 1,318; grade | 262.9 | 1364 |
| Mud Lake, water, 1,328; grade | 263.3 | 1355 |
| Feist Lake, water, 1,326; grade | 264.3 | 1347 |
| Turtle Lake, water, 1,366; grade | 265.1 | 1376 |
| Summit Station, cutting near, 10 feet; grade | 265.4 | 1385 |
| Summit Lake, water, 1,384; grade | 265.6 | 1385 |
| Clare Lake, water, 1,284; grade | 270.3 | 1295 |
| Viaduct Lake, water, 1,246; grade | 271.6 | 1282 |
| Hawk Lake Station | 272.9 | 1289 |
| Outlet of Narrow Lake, bed, 1,220; grade | 275.1 | 1256 |
| Trout Lake Creek, bed, 1,213; grade | 280.6 | 1248 |
| Beaver (depression of grade near Beaver Dam Lake) | 284.1 | 1186 |
| Rosslund | 288.9 | 1128 |
| Rat Portage | 297.3 | 1087 |
| Winnipeg River, outlet of the Lake of the Woods, low water, at same level with this lake, 1,057; grade | 298.1 | 1087 |
| Lake of the Woods, mean, 1,060; low and high water | 298.1 | 1057-1063 |
| (Dr. A. C. Lawson states that this lake "has a rise and fall through a range of 10 feet."—Geol. Survey of Canada, Ann. Rep., 1885, p. 18 CC.) | | |
| Keewatin | 300.8 | 1075 |
| Winnipeg Bay, water, 1,043; grade | 301.6 | 1062 |
| Mink Bay, water, 1,043; grade | 302.4 | 1070 |
| Winnipeg Bay, water, 1,043; grade | 303.7 | 1078 |
| War Eagle Lake, water, 1,062; grade | 305.8 | 1121 |
| Ostersund | 308.3 | 1105 |
| Summit, cutting 33 feet; grade | 311.4 | 1187 |
| Lake Bobo or Helen, water, 1,138; grade | 312.7 | 1151 |
| Lake Deception, water, 1,094; grade | 313.1 | 1143 |
| Deception | 313.4 | 1136 |
| Bear or Greenwater Lake, grade | 315.2 | 1192 |
| Summit, at west end of a cut 35 feet deep; grade | 315.7 | 1218 |
| Monument Lake, grade | 318.3 | 1218 |
| Red Pine Lake, grade | 319.2 | 1226 |
| Fellows Lake, water, 1,235; grade (11 feet lower than the lake) | 319.7 | 1224 |
| Kalmar | 320.4 | 1217 |
| Summit Lake, water, 1,252; grade | 322.1 | 1255 |
| Kennedy Lake, water, 1,245; grade (2 feet lower than the lake) | 323.1 | 1243 |
| White Fish Lake, water, 1,213; grade | 323.8 | 1243 |
| Summit, 30 rods west from the center of a cut 33 feet deep; grade | 325.8 | 1221 |
| Ingolf | 328.2 | 1184 |
| Summit, cutting 30 feet; grade | 328.9 | 1190 |
| Cross Lake Station, water, 1,045; grade | 234.4 | 1092 |
| Depression, grade | 336.2 | 1053 |
| Telford | 338.5 | 1059 |
| Summit, grade, 2 feet above the natural surface | 342.3 | 1115 |
| For 2½ miles east and 1 mile west the surface is very smooth | | 1105-1113 |
| River Brenton, water, 1,041; grade | 348.7 | 1050 |
| Rennie | 349.0 | 1053 |
| Bog River, water, 996; grade | 354.7 | 1007 |
| Same, water, 993; grade | 356.2 | 996 |
| Darwin | 359.4 | 971 |
| (Westward to the Red River the country is mostly swamp, bearing alders and tamaracks. The swamp is underlaid by a hard bottom at depths varying commonly from 5 to 15 feet.) | | |
| Bog River, water, 927; grade | 364.0 | 935 |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM PORT ARTHUR TO WINNIPEG—Continued.

| | From Port Arthur. | Above the sea. |
|---|----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Whitemouth River, water, 877; grade | 368·1 | 900 |
| Whitemouth | 368·9 | 907 |
| Beaver Creek, water, 885; grade | 369·8 | 904 |
| Shelly | 374·9 | 929 |
| Monmouth | 384·9 | 879 |
| Bear Creek, water, 820; grade | 387·4 | 831 |
| Broken Head River, water, 784; grade | 391·1 | 796 |
| Beausejour | 394·3 | 814 |
| Tyndall | 400·9 | 796 |
| Devil's Creek, water, 770; grade | 402·3 | 777 |
| East Selkirk | 408·9 | 743 |
| (Red River at West Selkirk, 2 miles west from East Selkirk, "ice, 1876" (probably 2 or 3 feet above extreme low water), 712; flood of 1876, 723; flood of 1875, 725; extreme high water, flood of 1826, 732. The railway at East Selkirk turns southward, leaving the line of its original survey, which crossed the Red River here.) | | |
| Extreme range in height of river | 411·0 | 710-732 |
| Lake Winnipeg, mean, 710; low and high water, approximately | | 708-713 |
| Cook's Creek, water | 409·1 | 728 |
| Gonor | 415·0 | 757 |
| Bird's Hill Station | 422·1 | 759 |
| Winnipeg Junction, Emerson Branch | 427·8 | 752 |
| Red River, extreme low water, 723; highest water in ordinary years, 735-740; high water, 1882, 749; grade, Louise Bridge | 429·0 | 752 |
| Winnipeg | 429·8 | 757 |

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD.

[From profile in the office of R. M. Pratt, engineer, Winnipeg. This profile was carefully revised after the construction of the road, and seems entitled to entire confidence.]

With uniform addition of 24 feet (page 40).

| | From Winni- peg. | Above the sea. |
|---|---------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Winnipeg, 1,422·8 miles from Montreal | 0·0 | 757 |
| Junction of Southwestern Branch | 1·1 | 760 |
| Junction of Manitoba and Southwestern Railway | 1·2 | 760 |
| Junction of West Selkirk Branch | 1·5 | 759 |
| Point of beginning of the original profile (at 0 of distances measured thence westward) | 1·8 | 761 |
| Air Line Junction, of Stonewall Branch | 1·9 | 761 |
| Colony Creek, water, 769; grade | 3·3 | 776 |
| Same, water, 772; grade | 4·0 | 780 |
| Junction of Winnipeg and Hudson Bay Railway | 4·7 | 780 |
| Bergen | 7·4 | 784 |
| Rosser | 15·2 | 796 |
| Meadows | 22·3 | 793 |
| Marquette | 28·9 | 807 |
| Reaburn | 35·2 | 806 |
| Long Lake, ordinary low and high water, 798-803; grade | 35·7 | 804 |
| Poplar Point | 40·4 | 815 |
| High Bluff | 48·7 | 823 |
| Portage la Prairie, junction of the Manitoba and North-western Railway | 56·0 | 854 |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD—Continued.

| | From Winni- peg. | Above the sea. |
|--|---------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Dry Creek, bed, 858; grade | 63.4 | 872 |
| Burnside | 63.5 | 872 |
| Rat Creek, water, 862; grade | 65.1 | 890 |
| Bagot | 71.1 | 935 |
| Image Creek, water, 939; grade | 75.6 | 953 |
| McGregor | 77.6 | 961 |
| Austin | 84.5 | 1005 |
| Lower Campbell (b) Beach of Lake Agassiz, crest, 1,066; grade | 86.9 | 1061 |
| Upper Campbell (aa) Beach, crest, 1,081; grade | 87.2 | 1076 |
| Upper Campbell (a) Beach, crest, 1,087; grade | 87.5 | 1085 |
| (These beach ridges are each about 30 rods wide, with descents of 10 to 20 feet from their crests to their east bases and half as much to the west. A very uneven profile, intersected by numerous ra- vines, extends from 89.3 to 92 miles, in which dis- tance the grade rises upon the front of the Assini- boine Delta of Lake Agassiz from 1,124 to 1,232 feet.) | | |
| Sydney | 92.6 | 1232 |
| (It is again very uneven from 93.7 to 95.9 miles, in which distance the grade ranges from 1,234 to 1,251 feet, crossing low dunes on the delta plain. Here and westward the profile shows frequent lakelets, but no names of them are given.) | | |
| Melbourne | 98.0 | 1248 |
| Pine Creek, water, 1,199; grade | 99.7 | 1224 |
| (Uneven surface of low dunes extends from 101.1 to 102.7 miles, the grade ranging from 1,244 to 1,257 feet.) | | |
| Carberry | 105.5 | 1258 |
| Herman (dd) Beach of Lake Agassiz, crest, 1,263; grade .. | 107.6 | 1264 |
| Herman (d) Beach, crest, 1,268; grade .. | 108.9 | 1267 |
| (Each of these beach ridges is about 25 rods wide, with crest about 5 feet above the adjoining land; but west of the west beach (d) is a depression of 10 to 12 feet, about 50 rods wide, succeeded farther west by land slightly—only a few feet—above these beaches. Very uneven contour of dune sand reaches from 110.2 miles (grade, 1,274) to 112.7 miles (grade, 1,249.) | | |
| Sewell | 114.2 | 1255 |
| (Two slight summits of grade, probably crests of the Herman (d) Beach, natural surface and grade the same (1,268 feet), are crossed at 116.3 and 116.8 miles.) | | |
| Douglas | 121.5 | 1222 |
| Chater | 127.2 | 1213 |
| Assiniboine River, water, 1,161; grade | 131.0 | 1177 |
| Brandon | 132.7 | 1194 |
| Kemnay | 140.9 | 1364 |
| Alexander | 148.4 | 1406 |
| Griswold | 157.4 | 1417 |
| Flat Creek, water, 1,376; grade | 162.4 | 1391 |
| Oak Lake Station | 164.7 | 1415 |
| Gopher Creek, water, 1,404; grade | 178.9 | 1422 |
| Virden | 180.0 | 1444 |
| Hargrave | 188.1 | 1579 |
| Elkhorn | 196.6 | 1630 |
| Fleming | 210.8 | 1794 |
| ..... | 219.1 | 1884 |
| ..... | 226.4 | 1917 |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD—Continued.

| | From Winni- peg. | Above the sea. |
|---|---------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Wapella | 235.2 | 1930 |
| Burrows | 242.8 | 1948 |
| Whitewood | 249.2 | 1966 |
| Percival | 256.2 | 2038 |
| Summit, grade | 257.9 | 2054 |
| Broadview | 263.8 | 1960 |
| Oakshela | 272.0 | 1952 |
| Grenfell | 279.9 | 1957 |
| Summerberry | 287.4 | 1938 |
| Wolseley | 295.1 | 1950 |
| Sintaluta | 303.9 | 1984 |
| Indian Head | 314.1 | 1924 |
| Qu' Appelle | 323.8 | 2134 |
| McLean | 332.4 | 2284 |
| Summit, grade | 334.3 | 2286 |
| Balgonie | 341.5 | 2187 |
| Pilot Butte | 348.0 | 2016 |
| Regina, junction of the Regina and Long Lake Railway. | 356.6 | 1885 |
| Pile of Bones Creek (Wascana River), grade | 358.6 | 1861 |
| Grand Coulee Station | 366.1 | 1857 |
| Grand Coulee (creek), grade | 368.7 | 1842 |
| Pense | 373.5 | 1881 |
| Belle Plaine | 381.3 | 1902 |
| Pasqua | 390.2 | 1872 |
| Moose Jaw Creek, grade | 398.1 | 1761 |
| Moose Jaw | 398.3 | 1767 |
| Boharm | 406.5 | 1792 |
| Caron | 414.5 | 1841 |
| Mortlach | 423.6 | 1961 |
| Parkbeg | 432.8 | 1982 |
| Summit, grade | 442.9 | 2282 |
| Secretan (on the Missouri Coteau) | 443.2 | 2282 |
| Chaplin | 452.0 | 2202 |
| Ernfold | 461.4 | 2238 |
| Summit, grade | 464.2 | 2374 |
| Morse | 471.8 | 2274 |
| Herbert | 480.6 | 2311 |
| Summit, grade | 485.2 | 2377 |
| Rush Lake Station | 489.3 | 2301 |
| Summit, grade | 495.4 | 2420 |
| Waldec | 496.7 | 2357 |
| Aiken's | 504.8 | 2401 |
| Swift Current Creek, grade | 509.7 | 2415 |
| Swift Current Station | 510.6 | 2423 |
| Leven | 519.6 | 2467 |
| Goose Lake Station | 528.9 | 2465 |
| Summit, grade | 532.3 | 2556 |
| Depression, grade | 533.7 | 2542 |
| Summit, grade | 535.5 | 2590 |
| Antelope | 538.5 | 2556 |
| Gull Lake Station | 546.3 | 2562 |
| Cypress | 554.8 | 2637 |
| Sidewood | 565.4 | 2478 |
| Crane Lake Station | 575.5 | 2518 |
| Summit, grade | 583.9 | 2568 |
| Colley | 585.9 | 2509 |
| Summit, grade | 589.2 | 2561 |
| Maple Creek Station | 596.7 | 2495 |
| Maple Creek, grade | 597.2 | 2497 |
| Kincarth | 605.9 | 2531 |
| Summit, grade | 608.9 | 2546 |
| Forres | 615.5 | 2428 |
| Walsh | 627.9 | 2433 |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD—Continued.

| | From Winni- peg. | Above the sea. |
|--|---------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Summit, grade..... | 636.4 | 2522 |
| Irvine | 638.3 | 2493 |
| Dunmore, junction of the Northwest Coal and Naviga- tion Company's Railway..... | 652.8 | 2405 |
| Medicine Hat..... | 660.3 | 2171 |
| South Saskatchewan River, low and high water, 2,137- 2,154; grade..... | 660.6 | 2173 |
| Stair..... | 667.3 | 2431 |
| Bowell..... | 675.1 | 2582 |
| Summit, grade..... | 675.7 | 2594 |
| Depression at tank, grade..... | 682.6 | 2384 |
| Suffield..... | 686.6 | 2455 |
| Langevin (a summit of grade)..... | 695.2 | 2495 |
| Kininvie..... | 704.1 | 2429 |
| Tilley..... | 713.3 | 2462 |
| Summit, grade..... | 719.3 | 2506 |
| Bantry..... | 723.1 | 2471 |
| Tank, 4 miles west of last..... | 727.1 | 2474 |
| Caasila..... | 733.1 | 2517 |
| Southesk..... | 740.7 | 2501 |
| Lathom..... | 748.9 | 2559 |
| Bassano..... | 757.5 | 2589 |
| Summit, grade..... | 764.4 | 2722 |
| Crowfoot..... | 765.9 | 2698 |
| Summit, a half mile east of tank..... | 768.4 | 2739 |
| Crowfoot Creek, grade..... | 770.1 | 2689 |
| Cluny..... | 776.5 | 2850 |
| Gleichen..... | 784.8 | 2952 |
| Summit, grade..... | 790.0 | 2997 |
| Namaka..... | 793.8 | 2971 |
| Summit, near tank..... | 796.2 | 3038 |
| Strathmore..... | 801.0 | 3032 |
| Cheadle..... | 809.4 | 3189 |
| Summit, grade..... | 815.0 | 3306 |
| Langdon..... | 819.5 | 3292 |
| Summit, grade..... | 824.8 | 3373 |
| Depression, grade..... | 828.2 | 3334 |
| Shepard..... | 830.1 | 3370 |
| Summit, grade..... | 832.9 | 3409 |
| Bow River, grade..... | 836.8 | 3377 |
| Elbow River, water, 3394; grade..... | 839.2 | 3411 |
| Bow River, at the mouth of Elbow River, water..... | 839.2 | 3390 |
| Calgary..... | 840.1 | 3421 |
| Keith..... | 849.4 | 3547 |
| Cochrane..... | 862.9 | 3743 |
| Radnor..... | 873.1 | 3876 |
| Morley..... | 881.6 | 4061 |
| Kananaskis River, bed..... | 892.0 | 4149 |
| Kananaskis..... | 894.1 | 4214 |
| The Gap, station..... | 901.9 | 4225 |
| Bow River here, at point of issue from the mountains, water, about..... | 901.9 | 4215 |
| Branch of Bow River, water..... | 902.3 | 4220 |
| Canmore..... | 907.2 | 4278 |
| Bow River, water..... | 914.5 | 4359 |
| Duthill..... | 914.8 | 4380 |
| Devil's Head Creek, water..... | 916.1 | 4436 |
| Anthracite..... | 917.3 | 4484 |
| Banff (new station)..... | 921.8 | 4515 |
| Forty-Mile Creek, water..... | 922.0 | 4505 |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD—Continued.

| | From Winni- peg. | Above the sea. |
|--|---------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Cascade | 927·9 | 4531 |
| Bow River, water | 934·2 | 4586 |
| Castle Mountain, station | 938·6 | 4653 |
| Eldon | 946·3 | 4804 |
| Baker's Creek, water | 948·6 | 4852 |
| Lion Creek, water, 4,949 ; grade | 954·2 | 4970 |
| Laggan | 956·2 | 5029 |
| North Branch of Bow River, water | 956·2 | 5020 |
| South Branch of Bow River, water | 957·8 | 5049 |
| Bath Creek, water | 961·3 | 5263 |
| Summit of grade crossing the Rocky Mountains, Wapta or Kicking Horse Pass | | |
| Stephen | 962·2 | 5323 |
| Summit Lake, water | 962·7 | 5313 |
| Hector | 962·7 | 5308 |
| Kicking Horse Lake, water | 965·0 | 5197 |
| Kicking Horse River, first crossing, water | 965·0 | 5190 |
| Mount Stephen tunnel, grade | 966·2 | 5184 |
| Field | 970·4 | 4335 |
| Muskeg Summit, grade | 973·2 | 4058 |
| Ottertail Creek, water, 3,746 ; grade | 975·7 | 4164 |
| Ottertail | 978·4 | 3856 |
| Kicking Horse River, water | 980·2 | 3689 |
| Leancoil | 981·4 | 3665 |
| Summit, grade | 986·4 | 3570 |
| Kicking Horse River, fourth crossing, water | 988·6 | 3669 |
| Palliser | 992·7 | 3287 |
| Kicking Horse River, sixth crossing, water, 2,666 ; grade | 994·2 | 3275 |
| Golden | 1003·5 | 2682 |
| Columbia River here, at the mouth of Kicking Horse River, water | 1006·7 | 2570 |
| Arm of Columbia River, water | 1006·7 | 2557 |
| Moberly House | 1008·7 | 2538 |
| Blueberry Creek, water | 1013·4 | 2537 |
| Donald | 1016·7 | 2544 |
| Columbia River, first crossing, grade | 1023·6 | 2565 |
| | 1024·4 | 2544 |

MAIN LINE THROUGH BRITISH COLUMBIA, FROM DONALD TO VANCOUVER.

From H. Abbott, superintendent of the Pacific division, Vancouver, whose figures, referred to the level of the Pacific Ocean, are given without change in the first column of these elevations, showing at Donald a discrepancy of 39 feet above the preceding series from Winnipeg, Lake Superior, and the Atlantic. In the second column these figures are revised by subtraction of 39 feet from the east end of the series for agreement at Donald; by comparison with a profile from Donald to Sicamous, supplied by P. A. Peterson, engineer, Montreal, which indicates that this correction should be reduced to 30 feet at Glacier House and onward, and to 20 feet at Twin Butte and onward; and by comparison with elevations supplied by Dr. G. M. Dawson, copied from profiles in the office of Collingwood Schreiber, engineer of government railways, Ottawa, which seem to require a continuance of this subtraction of 20 feet west to Notch Hill and Shuswap, beyond which they indicate that the elevations received from Mr. Abbott are probably correct. This line, however, needs verification by leveling from Donald to Lytton, about 300 miles, within which distance the discrepancy of 39 feet noted at Donald can probably be eliminated. At Lytton, and through the remaining distance of about 150 miles to Vancouver, these elevations agree with those published by Dr. Dawson in advance sheets of the second edition of Macfarlane's American Geological Railway Guide, and with the blue print condensed profile prepared in the engineer's office of this railway, Montreal.

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE THROUGH BRITISH COLUMBIA, FROM DONALD TO VANCOUVER.

| | From Winnipeg. | Above the sea (Abbott). | Above the sea (re- vised). |
|---|-------------------|----------------------------|----------------------------------|
| | <i>Miles.</i> | <i>Feet.</i> | <i>Feet.</i> |
| Donald | 1023·6 | 2604 | 2565 |
| Beaver | 1035·6 | 2453 | 2414 |
| Six-Mile Creek Station | 1041·0 | 2633 | 2594 |
| Bear Creek Station | 1050·0 | 3680 | 3641 |
| Rogers Pass Station | 1055·0 | 4222 | 4183 |
| Summit grade in Rogers Pass, crossing the Selkirk Mountains | 1056·5 | 4366 | 4327 |
| Glacier House Station | 1059·0 | 4102 | 4072 |
| Ross Peak siding | 1065·5 | 3471 | 3441 |
| Illecillewaet | 1074·5 | 2740 | 2710 |
| Albert Canyon Station | 1081·0 | 2244 | 2214 |
| Twin Butte Station | 1091·0 | 1918 | 1898 |
| Revelstoke (at the second crossing of the Columbia River) | 1103·0 | 1515 | 1495 |
| Summit grade in Eagle Pass, crossing the Gold range | 1111·0 | 1848 | 1828 |
| Clanwilliam | 1112·0 | 1827 | 1807 |
| Griffin Lake Station | 1120·0 | 1537 | 1517 |
| Craigellachie | 1130·5 | 1259 | 1239 |
| Sicamous Bridge, crossing narrows of Shuswap Lake, 1,173 (1,153); Sicamous Station | 1147·0 | 1171 | 1151 |
| Salmon Arm | 1166·0 | 1175 | 1155 |
| Tappen siding | 1173·5 | 1168 | 1148 |
| Notch Hill Station (Shuswap summit) | 1183·0 | 1708 | 1698 |
| Shuswap | 1198·5 | 1173 | 1153 |
| Duck's | 1214·5 | 1150 | ..... |
| Kamloops | 1231·5 | 1153 | ..... |
| Tranquille | 1239·5 | 1134 | ..... |
| Cherry Creek Station | 1245·5 | 1134 | ..... |
| Savona's | 1256·5 | 1158 | ..... |
| Penny's | 1262·5 | 1252 | ..... |
| Ashcroft | 1276·5 | 996 | ..... |
| Spatsum | 1291·5 | 854 | ..... |
| Spence's Bridge Station | 1303·5 | 768 | ..... |
| Drynock | 1309·5 | 752 | ..... |
| Lytton | 1325·5 | 687 | ..... |
| Cisco | 1331·5 | 58 | ..... |
| Keefer's | 1341·5 | 555 | ..... |
| North Bend | 1352·5 | 487 | ..... |
| Spuzzum | 1367·5 | 394 | ..... |
| Yale | 1379·5 | 217 | ..... |
| Hope | 1393·5 | 208 | ..... |
| Ruby Creek Station | 1401·5 | 94 | ..... |
| Agassiz | 1411·5 | 52 | ..... |
| Harrison | 1420·5 | 38 | ..... |
| Nicomen | 1429·5 | 23 | ..... |
| Mission | 1439·5 | 33 | ..... |
| Wharlock | 1449·5 | 14 | ..... |
| Hammond | 1457·5 | 19 | ..... |
| Port Moody | 1469·5 | 5 | ..... |
| Hastings | 1478·0 | 22 | ..... |
| Vancouver, 2,904·8 miles from Montreal | 1482·0 | 3 | ..... |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

EMERSON BRANCH.

[From Collingwood Schreiber, engineer of government railways, Ottawa.]

It agrees with the St. Paul, Minneapolis and Manitoba Railway on the international boundary (page 39).

| | From Winni- peg. | Above the sea. |
|---|---------------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Winnipeg..... | 0·0 | 757 |
| Red River, grade on Louise Bridge..... | 0·8 | 752 |
| Winnipeg Junction (of this branch with the main line)... | 2·0 | 752 |
| St. Boniface, 429·6 miles from Port Arthur..... | 3·0 | 754 |
| River Seine, high water..... | 10·5 | 760 |
| St. Norbert..... | 12·0 | 767 |
| Niverville..... | 23·5 | 774 |
| Rat River, low water, 752; high water..... | 30·0 | 763 |
| Otterburne..... | 30·6 | 779 |
| Dufrost..... | 39·0 | 791 |
| Arnaud..... | 47·0 | 794 |
| Roseau River, low water, 761; extreme high water, 1880.. | 54·5 | 779 |
| Dominion City..... | 55·0 | 785 |
| Joe River, low water, 756; high water..... | 62·6 | 785 |
| Emerson, 391·1 miles from St. Paul..... | 65·0 | 790 |
| Grade on the international boundary, connection with the St. Paul, Minneapolis and Manitoba Railway..... | 65·1 | 790 |

SOUTHWESTERN BRANCH.

[From R. M. Pratt, engineer, Winnipeg; and west of Manitou in part from profile in the office of P. A. Peterson, engineer, Montreal.]

The profile requires a uniform addition of 24 feet (page 40), which is made here. It agrees near Gretna and at Emerson with lines of the St. Paul, Minneapolis and Manitoba Railway on the international boundary, and at Thornhill with leveling from Park River, North Dakota, in the survey of the beaches of Lake Agassiz.

| | From Winni- peg. | Above the sea. |
|--|---------------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Winnipeg, 1,422·8 miles from Montreal..... | 0·0 | 757 |
| Junction of this branch with the main line..... | 1·1 | 760 |
| St. James..... | 3·6 | 764 |
| Assiniboine River, ordinary low and high water..... | 3·7 | 736-754 |
| La Salle (or Stinking) River, ordinary low and high water..... | 18·3 | 737-750 |
| La Salle Station..... | 18·5 | 770 |
| Scratching River (Rivière aux Gratiass), low and high water..... | 42·0 | 744-770 |
| (The upper part of this stream, above the marshes, in which it is lost in T. 7, Rs. 2, 3, and 4, is called Boyne River, Rivière aux Iles du Bois.) | | |
| Morris..... | 42·8 | 772 |
| Rosenfeld, junction of lines to the south and west..... | 56·2 | 796 |
| On the line south from Rosenfeld: | | |
| Gretna..... | 70·1 | 829 |
| Grade on the international boundary, connection with the Neche line of the St. Paul, Minneapolis and Manitoba Ry..... | 70·4 | 830 |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

SOUTHWESTERN BRANCH—Continued.

| | From Winni- peg. | Above the sea. |
|---|---------------------|----------------|
| | Miles. | Feet. |
| On the line (abandoned) from Rosenfeld to Emerson: | | |
| Crossing the first initial meridian, grade | 62.1 | 794 |
| Marais River (Rivière aux Marais), bed | 68.9 | 781 |
| West Lynne | 75.7 | 790 |
| Red River, low and high water | 77.0 | 750-787 |
| Emerson | 77.2 | 790 |
| On the line west from Rosenfeld: | | |
| Morden | 80.6 | 978 |
| Thornhill | 87.9 | 1314 |
| Summit, grade | 94.4 | 1588 |
| Darlingford | 95.9 | 1560 |
| Summit, grade | 99.4 | 1618 |
| Manitou | 102.4 | 1586 |
| (In the descent from the top of the bluff of the Pembina River Valley at 106 miles (grade, 1,552) to its bottom at 112 miles, the profile is very irregular, with frequent cuts 10 to 50 feet deep and fills of 10 to 30 feet.) | | |
| La Rivière | 112.5 | 1304 |
| Pembina River, water, 1,287; grade | 112.7 | 1304 |
| (Ascending from the Pembina Valley, the profile is broken by many ravines to 119 miles, where grade at the top of the bluff is 1,547 feet. The width of this valley is 1 to 2 miles.) | | |
| Pilot Mound | 125.2 | 1549 |
| Summit, grade | 125.9 | 1555 |
| Crystal City | 130.0 | 1513 |
| Crystal Creek, water, 1,474; grade | 130.6 | 1500 |
| Summit, natural surface and grade | 132.2 | 1519 |
| Clearwater, water of Clearwater Creek (Cypress River), 1,426; grade at station | 134.1 | 1498 |
| (Smoothly undulating contour reaches from 137 to 141 miles, with grades from 1,515 to 1,532 feet; also between 141 and 147 miles, with grades from 1,525 to 1,535 feet.) | | |
| Cartwright | 144.9 | 1533 |
| Badger Creek, water, 1,476; grade | 147.6 | 1509 |
| (Moderately undulating surface extends thence to 156 miles, the highest grades being 1,535 to 1,551 feet.) | | |
| Holmfild | 155.4 | 1551 |
| Long River (White Mud River), water, 1,541; grade | 155.7 | 1551 |
| (Thence the line rises gradually westward to 169.4 miles, where the natural surface and grade are 1,649 feet.) | | |
| Killarney | 164.1 | 1625 |
| Little Pembina Station | 169.7 | 1649 |
| Pembina River, water, 1,605; grade | 170.3 | 1645 |
| (The valley here is only 40 feet deep and about 40 rods wide.) | | |
| Lake, water, 1,636; grade | 171.7 | 1641 |
| Lake, water, 1,645; grade | 172.2 | 1648 |
| Summit, level grade | 181.1-181.7 | 1630 |
| Boissevain | 182.7 | 1683 |
| Whitewater Lake, low and high water | 192.7 | 1632-1637 |
| Deloraine | 202.7 | 1644 |
| (The last 25 miles of this line lie near the northern base of Turtle Mountain.) | | |

CANADIAN PACIFIC RAILROAD SYSTEM—Continued.

MANITOBA AND SOUTHWESTERN RAILWAY.

(Operated by the Canadian Pacific Railway Company.)

[From R. M. Pratt, engineer, Winnipeg; and west of Elm Creek in part from profile in the office of P. A. Peterson, engineer, Montreal; with uniform addition of 24 feet (page 40).]

| | From Winni- peg. | Above the sea. |
|--|---------------------|----------------|
| | Miles. | Feet. |
| Winnipeg..... | 0·0 | 757 |
| Junction with Canadian Pacific Railway..... | 1·2 | 760 |
| Colony Creek, bed..... | 2·8 | 758 |
| Sturgeon Creek, low water..... | 7·5 | 756 |
| Assiniboine River, low and high water..... | 14·0 | 754-764 |
| Headingly..... | 14·2 | 776 |
| La Salle River, low and high water..... | 26·8 | 766-774 |
| Starbuck..... | 27·2 | 781 |
| Elm Creek Station, junction of Carman Branch..... | 45·0 | 819 |
| On the Carman Branch: | | |
| Maryland (on the Burnside beach of Lake Agassiz)... | 47·5 | 844 |
| Barnsley (end of track)..... | 51·0 | 854 |
| End of grade, 1 mile north of Carman..... | 56·0 | 861 |
| Boyne River (Rivière aux Îles du Bois), low and high water..... | 56·5 | 842-854 |
| On the main line west from Elm Creek Junction: | | |
| Burnside Beach of Lake Agassiz, crest, 845; grade .. | 46·1 | 841 |
| (The descent from the crest eastward is 10 feet in 25 rods, and westward 7 feet in an equal distance.) | | |
| Slough, water, 965; grade..... | 57·8 | 967 |
| Slough, water, 1,004; grade..... | 61·7 | 1016 |
| Slough, water, 1,022; grade..... | 63·6 | 1024 |
| Slough, water, 1,043; grade..... | 66·0 | 1045 |
| Boyne River, low water, 1,034; grade..... | 68·9 | 1047 |
| Norcross (b) Beach of Lake Agassiz, crest, 1,167; grade .. | 75·2 | 1162 |
| (The descent from the crest eastward is 15 feet, and westward 10 feet.) | | |
| Norcross (a) Beach, crest, 1,195; grade..... | 75·7 | 1191 |
| Herman (dd) Beach, crest, 1,211; grade..... | 76·0 | 1206 |
| (The descent from the crest eastward is 15 feet, and westward 7 feet.) | | |
| Summit on the Herman (d) Beach, natural surface and grade..... | 76·2 | 1217 |
| Little Boyne River, low water, 1,169; grade..... | 77·3 | 1209 |
| Treherne..... | 77·6 | 1212 |
| Boyne River, low water, 1,166; grade..... | 78·4 | 1222 |
| Herman (bb) Beach, crest, 1,252; grade..... | 80·6 | 1247 |
| (The descent from the crest, both to the east and west, is about 10 feet.) | | |
| Summit, natural surface and grade the same, being the highest grade on this profile..... | 84·8 | 1248 |
| Holland..... | 85·9 | 1237 |
| Cypress River Station..... | 95·0 | 1232 |
| Cypress River, low water..... | 95·7 | 1214 |
| Glenboro (end of track, 1886)..... | 105·0 | 1231 |
| Summit in Sec. 4, T. 6, R. 16..... | | 1489 |
| Divide between Souris River and Pelican Lake in Lang's Valley (the channel of a glacial river that flowed southeast from Lake Souris to the Pembina River).... | | 1364 |
| Prairie west of Lang's Valley..... | | 1524 |
| Souris River at Souris City..... | | 1164 |
| Souris River at Milford..... | | 1114 |

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

WEST SELKIRK BRANCH.

(From profile in the office of P. A. Peterson, engineer, Montreal.)

[NOTE.—The two following branches of the Canadian Pacific Railway, running northward from Winnipeg on the west side of the Red River, receive an addition of 24 feet, like the main line from Winnipeg west.]

| | From Winni- peg. | Above the sea. |
|--|---------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Winnipeg..... | 0·0 | 757 |
| Junction with main line..... | 1·5 | 759 |
| (This branch is very nearly level, ranging from 760 to 750 feet, between Winnipeg and Lower Fort Garry (also called the "Stone Fort.") | | |
| Lower Fort Garry..... | 19·5 | 754 |
| West Selkirk..... | 23·5 | 736 |
| End of the "river track"..... | 24·1 | 724 |
| Red River, ordinary stages of low and high water..... | 24·1 | 712-725 |

STONEWALL BRANCH.

(From R. M. Pratt, engineer, Winnipeg.)

| | | |
|--|------|-----|
| Winnipeg..... | 0·0 | 757 |
| Air Line Junction, with main line..... | 1·9 | 761 |
| Stony Mountain Station..... | 13·3 | 773 |
| Stonewall..... | 19·8 | 810 |

WINNIPEG AND HUDSON BAY RAILWAY.

[From Collingwood Schreiber, engineer of government railways, Ottawa; with addition of 24 feet (page 40).]

| | | |
|---|-------|---------|
| Winnipeg..... | 0·0 | 757 |
| Junction with the Canadian Pacific Railway..... | 4·7 | 780 |
| Burnside Beach of Lake Agassiz about 3 miles south of Shoal Lake, crest and grade the same..... | 31·0 | 860 |
| Lowest natural surface crossed by this railway besides Shoal Lake, 852; grade..... | 38·2 | 855 |
| Shoal Lake, 5 to 15 feet deep, surface at ordinary low stage, 850; low and high water..... | ..... | 849-853 |

MANITOBA AND NORTHWESTERN RAILWAY.

(From profiles in the office of George H. Webster, engineer, Portage la Prairie.)

These profiles are referred to the Canadian Pacific Railway station at Portage la Prairie, which is called 100 feet. The original figures accordingly receive here a uniform addition of 754 feet to refer them to mean sea level.

MAIN LINE.

| | From Portage la Prairie. | Above the sea. |
|--|-----------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Portage la Prairie, Canadian Pacific Railway station, 1,478·8 miles west from Montreal, 56 miles west from Winnipeg..... | 0·0 | 854 |
| Same, Manitoba and Northwestern Railway station..... | 0·0 | 856 |

MANITOBA AND NORTHWESTERN RAILWAY—Continued.

MAIN LINE—Continued.

| | From Portage la Prairie. | Above the sea. |
|---|-----------------------------|----------------|
| | Miles. | Feet. |
| Channel by which the Assinboine River overflowed into Lake Manitoba, May 3-15, 1882, bed, 850; grade | 2.9 | 859 |
| Macdonald | 9.8 | 837 |
| Westbourne | 16.9 | 831 |
| White Mud River, first crossing, bed, 812; grade | 17.4 | 831 |
| Burnside Beach of Lake Agassiz, crest, 860-862; grade at switch of spur track to gravel pit | 21.8 | 860 |
| Woodside | 26.8 | 858 |
| White Mud River, second crossing, bed, 849; grade | 27.3 | 859 |
| Summit, grade (1 foot above natural surface) | 33.2 | 878 |
| Depression, filling 3 feet; grade | 34.0 | 876 |
| Gladstone Beach, natural surface at crest, 878; grade | 34.3 | 880 |
| Verge of plain of Gladstone, natural surface, 882; grade .. | 34.5 | 884 |
| Gladstone, section house and tank; grade | 34.7 | 884 |
| Same, passenger station | 34.9 | 883 |
| White Mud River, third crossing, bed, 871; grade | 35.7 | 889 |
| Gopher Creek, bed, 876; grade | 36.5 | 888 |
| Secondary Emerado Beach, 40 rods wide, crest, 916; grade .. | 39.1 | 917 |
| (Depression west of this, 914 feet, marking the begin- ning of a more rapid ascent westward.) | | |
| Emerado Beach, about 30 rods wide, crest, 927-929, wind- blown in hollows 1 to 2 feet below crest | 39.9 | 927-929 |
| (Depression west of this, 925.) | | |
| Third Blanchard Beach, crest and grade alike | 42.4 | 969 |
| (This beach ridge is 30 rods wide, with descent of 5 feet both to the east and west from its crest.) | | |
| Midway | 43.3 | 975 |
| Second Blanchard Beach, crest, 979; grade | 43.9-44.1 | 990 |
| (This deposit is almost flat, not having the usual ridged form. It is nearly a quarter of a mile wide, and is bordered on the west by a depression of 2 feet, to 977.) | | |
| First or Upper Blanchard Beach, another tract nearly like the last, natural surface, 994; grade | 45.3-45.4 | 995 |
| Depression, natural surface, 991; grade | 45.5 | 993 |
| Level grade ($\frac{1}{2}$ to 2 feet above the natural surface) | 45.7-46.1 | 1004 |
| Lower McCauleyville Beach, crest and grade alike | 46.4 | 1016 |
| (Depression west of this, 1,014.) | | |
| Middle McCauleyville Beach, crest, 1,029; grade | 47.0 | 1025 |
| (Descent of 3 and 5 feet, respectively, to the west and east from the crest.) | | |
| Stream, bed, 1,018; grade | 47.1 | 1027 |
| Upper McCauleyville Beach, crest, 1,039; grade | 47.6 | 1035 |
| (Descent of 4 and 6 feet, respectively, to the west and east from the crest.) | | |
| Lower Campbell Beach, crest, 1,061; grade | 48.2 | 1056 |
| (This beach ridge is 20 rods wide, with descent of 8 feet east and 5 feet west.) | | |
| Slight beach mark, natural surface | 48.6 | 1070 |
| Beginning of nearly level grade on the east margin of the Arden beach ridge (the Beautiful Plain), 2 feet above the natural surface | 48.7 | 1079 |
| Arden | 51.6 | 1086 |
| Upper Campbell Beach ridge, excavated for ballast, crest, 1,069; grade | 51.8 | 1084 |
| Snake Creek, bed, 1,061; grade | 52.0 | 1079 |
| Lower Tintah Beach ridge, crest and grade alike | 55.4 | 1111 |
| (This has a width of about 35 rods, with a descent of 4 feet to the east and 3 feet to the west.) | | |
| Beach ridge, associated with the preceding, crest, 1,115; grade | 55.7 | 1118 |

MANITOBA AND NORTHWESTERN RAILWAY—Continued.

MAIN LINE—Continued.

| | From Portage la Prairie. | Above the sea. |
|---|-----------------------------|----------------|
| | Miles. | Feet. |
| Dune crossed on steep grade, crest, 1,133; grade (Dunes 3 to 5 feet high occur at 57·15, 57·2, and 57·3 miles, with crest and grade alike in each, respectively 1,150, 1,152½, and 1,154 feet.) | 56·9 | 1134 |
| Level grade (0 to 7 feet above the natural surface) | 57·3 -57·7 | 1154 |
| Upper Tintah Beach, crest, 1,158; grade | 57·8 | 1157 |
| (This has a descent of 11 feet in 50 rods east, and 3 feet in 6 rods west.) | | |
| Nearly level natural surface, 1,174-1,172; grade | 58·1 -58·8 | 1174-1177 |
| Ridge of dune sand, crest, 1,177; grade | 58·9 | 1178 |
| (This has a descent of 5 feet to the east and 3 feet to the west.) | | |
| Ridge of dune sand, crest, 1,179; grade | 59·3 | 1180 |
| (This likewise has a descent of 5 feet to the east and 3 feet to the west.) | | |
| (Dunes at the level of the Lower Norcross Beach occur at 60·1, 60·2, 60·25, and 60·3 miles, with their crests successively at 1,192, 1,192½, 1,192¾, and 1,193½ feet. The hollows are 2, 4, and 5 feet deep in order from east to west, i. e., at 1,190, 1,188½, and 1,187½ feet.) | | |
| Grade here | 60·1 -60·5 | 1193 |
| (From the dunes at 58·9 miles and 59·3 miles to 60·5 miles the surface is wind-blown sand with hollows 2 to 4 feet deep. The railway bed formed of this sand is somewhat insecure, because of its liability to be channeled by the wind.) | | |
| Neepawa | 61·0 | 1206 |
| Upper Norcross Beach deposits, crests successively 1,223½, 1,225, and 1,225; grade | 61·45-61·6 | 1227-1232 |
| (The descent westward from each crest is only 1 foot.) | | |
| Eroded escarpment, base, 1,225; crest, 1,240; grade | 61·6 -61·67 | 1232-1239 |
| Herman (bb) Beach ridge, crest, 1,304; grade | 64·0 | 1305 |
| (This ridge has a width of 40 rods, with descent of 7 feet both to the east and west from its crest. It is found to consist of sand and gravel suitable for ballast, nearly like that of the Arden ridge, and has been purchased by the railway company for this use.) | | |
| Herman (b) Beach ridge, crest, 1,323; grade | 64·7 | 1320 |
| (This ridge descends 7 feet from crest to base in 15 rods, the amount of descent and length of slope being nearly alike on the east and west.) | | |
| Stony Creek, bed, 1,359; grade | 66·3 | 1373 |
| Bridge Creek Station | 70·3 | 1600 |
| Summit, grade (2 feet above natural surface) | 76·0 | 1798 |
| Little Saskatchewan River, bed, 1,654; grade | 78·4 | 1669 |
| Minnedosa, junction of Rapid City Branch | 78·5 | 1670 |
| Summit, grade (2 feet above natural surface) | 83·0 | 1928 |
| Depression, filling 8 feet; grade | 83·9 | 1906 |
| Summit, grade (3 feet above natural surface) | 87·0 | 1956 |
| Basswood | 88·5 | 1949 |
| Outlet from Basswood Lake, bed, 1,932; grade | 88·6 | 1950 |
| Summit, highest grade on this railway | 92·8 | 1983 |
| Newdale | 96·8 | 1975 |
| Grade and natural surface | 100·0 | 1972 |
| Grade and natural surface | 103·0 | 1950 |
| Strathclair | 106·1 | 1901 |
| Salt Lake, bed, 1,855; water, 1,860; grade | 108·3 | 1867 |
| Summit, cutting 4 feet; grade | 109·0 | 1879 |
| Shoal Lake Station | 114·9 | 1812 |
| Tak River, bed, 1,791; water, 1,794; grade | 115·0 | 1811 |

MANITOBA AND NORTHWESTERN RAILWAY—Continued.

MAIN LINE—Continued.

| | From Portage la Prairie. | Above the sea. |
|--|-----------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Shoal Lake, about a third of a mile south; water, approximately | 115·0 | 1793 |
| Summit, cutting 2 feet; grade | 117·0 | 1830 |
| Kelloc | 123·2 | 1814 |
| Solsgrith | 129·8 | 1789 |
| Grade (8 feet above natural surface) | 132·0 | 1697 |
| Ravine, bottom, 1,596; grade | 132·8 | 1648 |
| Birdtail Creek, bed, 1,538; water, 1,540; grade | 134·5 | 1558 |
| Summit, grade (1 foot above natural surface) | 137·0 | 1704 |
| Birtle | 137·6 | 1703 |
| Summit, cutting 1 foot; grade | 138·0 | 1706 |
| Stony Creek, bed, 1,683; grade | 139·0 | 1701 |
| Summit, grade (1 foot above natural surface) | 144·0 | 1747 |
| Foxwarren | 145·2 | 1742 |
| Summit, grade | 149·0 | 1772 |
| Silver Creek, bed, 1,631; water, 1,632; grade | 153·9 | 1704 |
| Binscarth, junction of Shell River Branch | 154·9 | 1713 |
| Two miles northwest of same, natural surface and grade | 157·0 | 1654 |
| Three miles farther northwest, natural surface, 1,515; grade | 160·0 | 1521 |
| Johnson's Creek, bed, 1,350; grade | 161·8 | 1408 |
| Old channel of Assiniboine River, bed, 1,317; stagnant water, 1,319; grade | 162·7 | 1349 |
| Assiniboine River, bed, 1,309; water, 1,314; grade | 162·9 | 1342 |
| One mile northwest of same, natural surface, 1,405; grade | 164·0 | 1408 |
| Two miles farther northwest, natural surface and grade | 166·0 | 1533 |
| Harrowby | 167·6 | 1593 |
| Grade and natural surface | 173·0 | 1638 |
| Langenburg | 180·1 | 1691 |

RAPID CITY BRANCH (SASKATCHEWAN AND WESTERN RAILWAY).

| | | |
|---|-------|------|
| Minnedosa, junction with main line | 78·5 | 1670 |
| Little Saskatchewan River, first crossing, bed, 1,643; water, 1,645; grade | 80·2 | 1658 |
| Riverdale | 87·1 | 1636 |
| Little Saskatchewan River, second crossing, bed, 1,569; water, 1,570; grade | 92·4 | 1579 |
| Rapid City | 93·9 | 1579 |
| A survey from Rapid City westward supplies the following: | | |
| Surface, SE. $\frac{1}{4}$ of Sec. 19, T. 13, R. 20 | 101·5 | 1701 |
| Surface, W. $\frac{1}{4}$ of Sec. 16, T. 13, R. 21 | 105·5 | 1734 |
| Oak River, Sec. 23, T. 13, R. 22, water, 1,668; proposed grade | 109·2 | 1703 |
| Surface on line between Secs. 28 and 33, T. 14, R. 25 | 132·0 | 1688 |
| Surface, SW. $\frac{1}{4}$ of Sec. 6, T. 15, R. 25 | 135·5 | 1623 |

SHELL RIVER BRANCH.

| | | |
|--|-------|------|
| Binscarth, junction with main line | 154·9 | 1713 |
| Four miles north of same, grade and natural surface | 158·9 | 1791 |
| Four miles farther north, grade (3 feet above natural surface) | 162·9 | 1797 |
| Russell | 166·2 | 1830 |

MANITOBA AND NORTHWESTERN RAILWAY—Continued.

LINE SURVEYED WEST FROM LANGENBURG TO THE SOUTH SIDE OF THE BEAVER HILLS.

| | From Portage la Prairie. | Above the sea. |
|--|-----------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Red Deer Horn Creek, bed | 185·0 | 1721 |
| Surface | 188·0 | 1729 |
| Surface | 195·0 | 1726 |
| Big Cut Arm Creek, bed | 198·5 | 1651 |
| Surface | 203·0 | 1720 |
| Surface | 210·0 | 1709 |
| Crescent and Leech Lakes, a few miles north of this line, approximately | | 1679 |
| Surface | 220·0 | 1763 |
| Surface | 230·0 | 1816 |
| Surface | 234·0 | 1863 |
| Ravine, bottom | 236·0 | 1882 |
| Surface, end of survey | 237·5 | 1919 |
| This line ends in the west part of T. 23, R. 7 W. from the second initial meridian, between the Beaver Hills on the north and the Pheasant Hills on the south, and about 15 miles east of the File Hills. | | |

LINE SURVEYED NORTHWEST FROM LANGENBURG, PASSING NORTHEAST AND
NORTH OF THE BEAVER HILLS.

| | | |
|--|-------|------|
| Summit | 194·0 | 1774 |
| Surface | 212·0 | 1721 |
| Armstrong's Coulee, first crossing, bed | 213·9 | 1686 |
| Same, second crossing, bed | 217·4 | 1652 |
| Yorkton | 222·5 | 1633 |
| Mill Creek (South Branch of White Sand River), bed | 223·3 | 1585 |
| Surface | 226·0 | 1620 |
| Summit | 231·0 | 1697 |
| Creek, bed | 233·1 | 1654 |
| Big Bone Creek (or Little White Sand River), bed | 233·5 | 1651 |
| Surface | 238·0 | 1690 |
| Owl Creek, bed | 240·2 | 1683 |
| Surface | 243·0 | 1709 |
| Clair Creek, bed | 244·5 | 1691 |
| Small Lake | 245·7 | 1711 |
| Surface | 252·0 | 1747 |
| Chippewa Creek, bed | 253·8 | 1736 |
| Surface | 256·5 | 1770 |
| Fern Creek, bed | 258·3 | 1747 |
| Surface | 260·0 | 1781 |
| Bear Creek, bed | 262·7 | 1762 |
| Spring Creek, bed | 265·3 | 1785 |
| Surface | 270·0 | 1820 |
| Water course, bed | 272·5 | 1813 |
| Surface | 273·0 | 1825 |
| Along its last 40 miles this line lies from 2 to 7 miles southwest of White Sand River. It terminates near the north side of T. 30, R. 10 W. from the second initial meridian, a few miles north of the Beaver Hills and about 25 miles east of the Big Touchwood Hills. | | |

NORTHWEST COAL AND NAVIGATION COMPANY'S RAILWAY.

[From Dr. George M. Dawson, of the Geological and Natural History Survey of Canada.]

| | From Dunmore. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Dunmore, junction with Canadian Pacific Railway, 652·8 miles from Winnipeg | 0 | 2405 |
| Bull's Head Creek, grade on bridge | 2 | 2314 |
| Seven Persons River, grade on bridge | 16 | 2446 |
| Crossing the west line of T. 11, R. 8, a summit of grade ... | 27 | 2772 |
| Entering the northeast corner of T. 10, R. 11 | 40 | 2592 |
| Depression, grade | 49 | 2562 |
| Crossing the west line of— | | |
| T. 10, R. 12 | 53 | 2614 |
| T. 10, R. 14 | 65 | 2609 |
| T. 9, R. 16 | 78 | 2677 |
| T. 9, R. 17 | 84 | 2707 |
| T. 9, R. 18 | 90 | 2768 |
| Depression, grade | 91 | 2751 |
| Crossing the west line of T. 9, R. 19 | 96·5 | 2806 |
| Same, T. 9, R. 20 | 103 | 2877 |
| Summit of grade | 106 | 2999 |
| Lethbridge | 109 | 2954 |

This elevation proves the approximate correctness of that barometrically determined by Dr. Dawson, before this railway was built, for the Belly River (2,717 feet) at the "Coal Banks," about a mile southwest of Lethbridge. The general surface of the country here is 250 to 300 feet above the river.

REGINA AND LONG LAKE RAILWAY.

[From R. M. Pratt, engineer, Winnipeg.]

| | From Regina. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Regina, junction with the Canadian Pacific Railway | 0·0 | 1885 |
| Qu'Appelle River, low water, 1,595; grade | 21·4 | 1609 |
| End of track | 22·2 | 1606 |
| Arm of Long Lake here, in Sec. 23, T. 20, R. 21, water ... | 22·2 | 1598 |

Longlaketon, at the southeast end of the main lake, is about 3 miles farther northwest.

ST. PAUL AND DULUTH RAILROAD.

[From profiles in the office of H. A. Swenson and C. A. F. Morris, engineers, St. Paul, showing changes made in 1887 in grades along the whole line and in the construction of a shorter line with less steep grades between the St. Louis River and Oneota Junction.]

The profile from new leveling in 1887, which is here followed, receives an addition of 407 feet from St. Paul to the Northern Pacific Junction, where it gives an elevation 5 feet less than the profile thence to Duluth. The latter portion receives an addition of 402 feet. The datum is Lake Superior, mean, 200; its true elevation being 602 feet, according to the United States Lake Survey. Without adjustment, excepting that indicated at Northern Pacific Junction, this line gives the elevation of the Mississippi River, low water, at St. Paul, 683 feet, which is a half foot higher than its determination by surveys from Lake Michigan by way of Winona. It agrees exactly or closely with connecting railways at St. Paul, Minneapolis, Gladstone, White Bear, and Hinckley; and its branches to Stillwater, Taylor's Falls, and Grantsburgh agree with elevations of the St. Croix River determined by United States engineers.

ST. PAUL AND DULUTH RAILROAD—Continued.

MAIN LINE.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. Paul, extreme low and high water in the Mississippi River | 0.0 | 683-702 |
| St. Paul, union depot | 0.0 | 703 |
| East Seventh Street, junction to terminal freight yard .. | 0.8 | 734 |
| Crossing beneath the Chicago, St. Paul, Minneapolis and Omaha Railway; St. Paul and Duluth grade | 1.6 | 809 |
| Phalen's Creek: | | |
| First crossing, water, 805; grade | 1.65 | 811 |
| Second crossing, water, 809; grade | 1.7 | 813 |
| Third crossing, water, 816; grade | 1.9 | 820 |
| Fourth crossing, water, 839; grade | 2.6 | 853 |
| Claymont (at St. Paul Harvester Works) | 2.9 | 865 |
| Phalen's Creek, fifth crossing, water, 856; grade | 3.1 | 868 |
| Lake Phalen, water, 859; grade | 3.7 | 862 |
| Gladstone | 4.9 | 898 |
| Junction with the Wisconsin Central Railroad | 5.1 | 899 |
| Summit, natural surface | 8.7 | 976 |
| Same, grade | 9.0 | 937 |
| Minneapolis and Duluth Junction | 10.0 | 927 |
| White Bear | 11.4 | 938 |
| White Bear Lake, low and high water | 11.4 | 923-926 |
| Junction of the Stillwater Branch | 11.6 | 938 |
| Crossing the Minneapolis, Sault Ste. Marie and Atlantic Railway | 12.5 | 929 |
| Bald Eagle | 12.9 | 928 |
| Bald Eagle Lake, water | 12.9 | 908 |
| Beaver Creek, water, 923; grade | 16.4 | 934 |
| Centerville | 16.7 | 933 |
| Beaver Dam pile-bridge, water, 920; grade | 17.5 | 932 |
| Rice Creek, water, 915; grade | 20.2 | 933 |
| Summit, cutting 9 feet; grade | 21.5 | 951 |
| Forest Lake Station | 25.0 | 912 |
| Forest Lake, water | 25.0 | 900 |
| Wyoming, junction of the Taylor's Falls Branch | 29.2 | 900 |
| South Branch of Sunrise River, water, 876; grade | 29.5 | 896 |
| Middle Branch of Sunrise River, water, 878; grade | 33.2 | 893 |
| Stacy | 33.4 | 896 |
| North Branch Station | 41.3 | 896 |
| North Branch of Sunrise River, water, 865; grade | 41.6 | 896 |
| Harris | 46.5 | 897 |
| Goose Creek, water, 870; grade | 46.7 | 899 |
| Spooner's Spur | 51.4 | 917 |
| Junction of the Grantsburg Branch | 53.1 | 917 |
| Rush Creek, water, 895; grade | 53.1 | 917 |
| Rush City | 53.3 | 917 |
| Balsam Creek, water, 926; grade | 56.5 | 934 |
| Long's Spur | 57.3 | 943 |
| South Branch of Rock Creek, water, 919; grade | 58.3 | 937 |
| North Branch of Rock Creek, water, 925; grade | 59.0 | 945 |
| Dowlan's Siding | 59.5 | 955 |
| Summit, natural surface | 60.7 | 986 |
| Same, grade | 60.9 | 975 |
| Cut, maximum depth 33 feet, but only 300 feet long; grade | 62.3 | 965 |
| Fill 16 feet, opposite to Devil's Lake; grade | 62.4 | 964 |
| Pine City | 63.2 | 952 |
| Snake River, bed, 920; low and high water, 928-938; grade | 63.4 | 950 |
| Summit, "Brown's Hill," cutting 22 feet; grade | 67.4 | 960 |
| Brown's Hill Siding | 69.2 | 975 |
| Mission Creek, water, 960; grade | 70.2 | 967 |
| Mission Creek Station | 73.1 | 995 |

ST. PAUL AND DULUTH RAILROAD—Continued.

MAIN LINE—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Cut, maximum depth 31 feet; grade..... | 74.2 | 1011 |
| Creek, water, 1,002; grade..... | 75.0 | 1017 |
| Junction, St. Cloud and Hinckley Branch, St. Paul, Minneapolis and Manitoba Railway..... | 76.1 | 1032 |
| Hinckley..... | 76.2 | 1032 |
| Grindstone River, water, 1,010; grade..... | 76.7 | 1032 |
| Summit, grade..... | 81.1 | 1117 |
| Same, natural surface..... | 81.2 | 1130 |
| Sandstone Junction..... | 83.6 | 1119 |
| Miller..... | 85.9 | 1136 |
| Finlayson..... | 89.4 | 1108 |
| Creek, water, 1,087; grade..... | 90.2 | 1095 |
| Pine River, water, 1,024; grade..... | 93.1 | 1051 |
| Kettle River Station..... | 94.3 | 1031 |
| Kettle River, water, 1,010; grade..... | 94.7 | 1029 |
| Willow River Station..... | 98.5 | 1038 |
| Willow River, water, 1,020; grade..... | 98.7 | 1037 |
| Sturgeon Lake Siding..... | 102.2-102.8 | 1067-1076 |
| Cut, 13 feet deep; grade..... | 103.7 | 1088 |
| Summit, natural surface and grade the same..... | 104.2 | 1095 |
| Moose Horn River, water, 1,038; grade..... | 107.7 | 1056 |
| Moose Lake Station..... | 108.8 | 1063 |
| Summit, natural surface..... | 111.8 | 1115 |
| Same, grade..... | 112.0 | 1108 |
| Barnum..... | 113.4 | 1100 |
| Moose Horn River, water, 1,091; grade..... | 113.5 | 1101 |
| Cut, 16 feet deep; grade..... | 114.1 | 1110 |
| Cut, 21 feet deep; grade..... | 117.1 | 1135 |
| Mahtowa..... | 119.5 | 1147 |
| Black Hoof Summit, natural surface and grade the same, highest on this railroad..... | 120.7 | 1170 |
| Otter Creek Siding..... | 125.2 | 1150 |
| Northern Pacific Junction..... | 131.5 | 1083 |
| St. Louis River, Dalles bridge, bed, 992; low and high water, 997-1,020; grade..... | 132.5 | 1044 |
| Thomson..... | 133.0 | 1055 |
| Big Gulch, bottom of culvert, 981; grade..... | 135.1 | 1095 |
| Summit Siding..... | 135.9-136.1 | 1115 |
| (Cut here has maximum depth of 24 feet.) | | |
| West Branch of Mission Creek, bed, 965; grade..... | 138.3 | 1015 |
| East Branch of Mission Creek, bed, 912; grade..... | 138.7 | 993 |
| Rock cut at southwest end of range of highland; grade..... | 141.2-141.3 | 863-858 |
| Siding..... | 143.2-144.2 | 742-722 |
| Oneota Junction, at west end of bridge over Kimball's Creek, water, 615; grade..... | 146.2 | 629 |
| Summit Level..... | 146.7-147.4 | 637 |
| Oneota..... | 148.3 | 631 |
| Duluth, passenger depot..... | 152.1 | 607 |
| Duluth, freight depot and elevators..... | 152.9 | 607 |
| Lake Superior, mean, 1871 to 1887..... | 152.9 | 601.56 |
| (Minnesota Point (recent beach at the head of Lake Superior), Duluth, has a width of 375 feet at the distance of 3,700 feet from the mainland on the lake side. Along this extent its elevation on the upper edge of the beach, next to the timber, varies from 6 to 11 feet above the lake; and the timbered belt of this point in some parts rises slightly higher.) | | |
| (Rice's Point (a western beach near the preceding and parallel with it), along an extent of 2,574 feet varies in elevation from 3½ to 10 feet above Lake Superior.) | | |

ST. PAUL AND DULUTH RAILROAD—Continued.

MINNEAPOLIS BRANCH.

| | From Minneapolis. | Above the sea. |
|--|----------------------|----------------|
| | Miles. | Feet. |
| Minneapolis, new St. Paul, Minneapolis and Manitoba (union) depot..... | 0.0 | 810 |
| Mississippi River, low and high water, 794-802; grade.. | 0.5 | 826 |
| East Minneapolis, Duluth depot | 1.0 | 833 |
| Junction, St. Paul, Minneapolis and Manitoba Railway.. | 1.3 | 835 |
| Crossing St. Paul, Minneapolis and Manitoba Railway... | 1.8 | 838 |
| Summit, cutting 7 feet; grade..... | 4.4 | 948 |
| Robinson Lake, water, 908; grade..... | 6.3 | 916 |
| Owassa | 6.7 | 927 |
| Bennett (or Reiling) Lake, water, 893; grade..... | 7.5 | 895 |
| Owassa (or Big Bass) Lake, water, 888; grade..... | 9.4 | 898 |
| Twin Lake, water, 879; grade | 10.5 | 883 |
| Minneapolis and Duluth Junction | 14.4 | 927 |

STILLWATER BRANCH.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | Miles. | Feet. |
| White Bear Junction..... | 11.6 | 938 |
| White Bear Lake, low and high water, 923-926; grade.. | 13.0 | 934 |
| Dellwood | 13.6 | 942 |
| Mahtomedi (a depression of grade)..... | 14.6 | 929 |
| Lake, water, 951; grade..... | 17.7 | 966 |
| Summit, cutting 20 feet; grade..... | 18.1 | 984 |
| Brown's Creek, bed, 858; grade | 21.1 | 867 |
| Same, bed, 837; grade | 21.6 | 853 |
| Stillwater | 23.3 | 723 |
| Same, zero of United States engineer's gauge, Lake St. Croix..... | | 666-95 |
| Same, zero of city levels, from Lewis W. Clarke, city engineer | | 638-70 |
| Lake St. Croix, ordinary stage of water, 672; extreme low and high water, 667-687; grade | 24.0 | 686 |

TAYLOR'S FALLS BRANCH.

| Wyoming, junction with the main line..... | 29.2 | 900 |
|--|-----------|---------|
| Summit, cutting 6 feet; grade | 30.0 | 903 |
| Sunrise River, water, 875; grade | 31.1 | 880 |
| Summit, natural surface and grade the same..... | 33.2 | 922 |
| Chisago City..... | 35.6 | 917 |
| Canal, water the same as Chisago Lake, 896; grade..... | 35.8 | 917 |
| Chisago Lake, water, 896; grade..... | 38.0 | 928 |
| Lindstrom | 38.2 | 932 |
| Summit, natural surface and grade | 38.7 | 937 |
| Chisago Lake, water, 896; grade..... | 39.8 | 901 |
| Center City..... | 39.9 | 901 |
| Summit, cutting 4 feet; grade..... | 42.2 | 946 |
| Shafer's | 43.4 | 937 |
| Franconia | 45.4 | 915 |
| Lawrence Creek, bed, 857; water, 861; grade..... | 45.9 | 901 |
| Cuts in sandstone, top of sandstone, 856-861; grade..... | 47.4-47.8 | 855-832 |
| Cut in trap, top of trap rock, 823; grade..... | 48.4-48.5 | 802-797 |
| Taylor's Falls, passenger depot | 48.7 | 791 |
| Same, freight depot and yard..... | 49.5 | 750 |
| St. Croix River here, a mile north from Taylor's Falls bridge, about. | 49.5 | 710 |

ST. PAUL AND DULUTH RAILROAD—Continued.

GRANTSBURG BRANCH.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| on near Rush City..... | 53.1 | 917 |
| Creek, water, 841; grade | 55.8 | 849 |
| ix River, water, 775; grade | 58.1 | 795 |
| t (at or near Benson), natural surface and grade .. | 68.6 | 921 |
| burg | 69.7 | 895 |

KNIFE FALLS BRANCH.

| | | |
|--|-------|------|
| ern Pacific Junction..... | 131.5 | 1083 |
| is River, crest of Knife Falls, 1,167, having a per- icular fall of 8 feet; high water on crest of falls, ; grade here | 136.4 | 1180 |
| Falls (Cloquet post-office) | 137.3 | 1192 |
| is River here, at head of the rapids above Knife s, ordinary stage, about..... | 137.3 | 1175 |

PRELIMINARY SURVEYS.

reliminary surveys for the St. Paul and Duluth Railroad in 1860 and 1864, of which the field-
notes were supplied by A. J. Hill, St. Paul.]

| | Feet above the sea. |
|---|---------------------|
| Lake, Sec. 23, White Bear, Ramsey County..... | 925 |
| Amelia, Sec. 35, Centerville, Anoka County..... | 906 |
| e Branch of Sunrise River, in the northeast part of Linwood, ka County..... | 877 |
| Lake, Chisago County..... | 910 |
| Lake, Chisago County..... | 906 |
| Lake, Secs. 8 and 9, T. 38, R. 21..... | 947 |
| River, close southwest of Pokegama Lake..... | 929 |
| ama Creek, Sec. 15, T. 40, R. 22..... | 1003 |
| Branch of Grindstone River, in the northeast part of T. 41, R. 22 | 1065 |
| v River, Sec. 33, T. 45, R. 19..... | 1047 |
| Lake, Secs. 26 and 35, T. 46, R. 19..... | 1105 |
| akes, east part of T. 43, R. 22, head of Pine River..... | 1075 |
| Branch of Kettle River, in the southeast corner of T. 46, R. 22.. | 1232 |
| st land crossed by the survey in 1860, situated in the SW. $\frac{1}{4}$ of 36, T. 47, R. 22..... | 1356 |
| n Secs. 3 and 9, T. 48, R. 20 (close south of Island Lake on the hern Pacific Railroad)..... | 1296 |
| River (15 feet wide, 4 feet deep), in the NW. $\frac{1}{4}$ of Sec. 8, T. 48, | 1280 |
| This is $\frac{1}{4}$ mile south of the Northern Pacific crossing of the same stream, where its bed is at 1,287 feet.) | |
| 4 miles east of the last, flowing northeastward to the Perch es, and so tributary to the Moose River..... | 1306 |
| River, near Norman..... | 1275 |
| (25 feet wide, 2 feet deep), in the NE. $\frac{1}{4}$ of Sec. 11, T. 48, R. 17.. | 1088 |
| s is about $1\frac{1}{2}$ miles west-southwest of the Northern Pacific nction.) | |
| Lake..... | 1105 |
| Lake..... | 1111 |
| is River (40 feet wide) below the upper falls (and east of the oad bridge), ordinary stage..... | 989 |
| high water..... | 1007 |
| e river here flows in a perpendicular gorge, south bank, 1,008; orth bank, 1,019.) | |

DULUTH AND IRON RANGE RAILROAD.

[From R. H. Lee, engineer, Duluth.]

| | From Duluth. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Lake Superior, mean, 1871 to 1887..... | 0·0 | 601·56 |
| Duluth, junction with the St. Paul and Duluth Railroad.. | 0·0 | 607 |
| Chester Creek, bed, 602; grade | 0·8 | 632 |
| Tischer Creek, bed, 634; grade | 2·6 | 667 |
| Summit, cutting 4 feet; grade | 3·0 | 686 |
| New London | 4·0 | 685 |
| Lester Park | 5·0 | 650 |
| Lester River, bed, 604; grade | 5·3 | 650 |
| Summit, cutting 2 feet; grade | 7·5 | 665 |
| Clifton | 8·0 | 661 |
| Talmage River, bed, 658; grade | 10·7 | 691 |
| Summit, natural surface and grade | 11·0 | 700 |
| French River, bed, 677; grade | 12·1 | 697 |
| Smith's Creek bed, 650; grade | 12·6 | 696 |
| Summit, cutting 9 feet; grade | 13·0 | 700 |
| Big Sucker River, bed, 630; grade | 14·8 | 684 |
| Little Sucker River, bed, 612; grade | 15·6 | 664 |
| Lake View | 16·0 | 661 |
| Stony Point, cutting 9 feet; grade | 16·7 | 671 |
| Knife River Station, bed of river, 602; grade | 18·7 | 620 |
| Summit, natural surface and grade | 24·5 | 767 |
| Two Harbors Junction | 26·1 | 692 |
| Two Harbors depot, $\frac{1}{2}$ mile south from the junction ..... | ..... | 634 |
| Sibiwissaa | 32·0 | 1280 |
| Gakadina Station, highest point on the line, cutting 26 feet; grade | 38·8 | 1734 |
| Little Cloquet River, bed, 1,498; grade | 44·2 | 1521 |
| Cloquet River Station, bed of Cloquet River, 1,477; grade | 46·2 | 1490 |
| Wissakode | 49·5 | 1578 |
| Summit, cutting 2 feet; grade | 51·4 | 1617 |
| Summit, cutting 29 feet; grade | 52·7 | 1615 |
| Outlet of Bassett Lake, bed, 1,570; grade | 53·2 | 1587 |
| Bassett Lake Station, cutting 19 feet; grade | 55·0 | 1642 |
| Whiteface River, bed, 1609; grade | 55·4 | 1635 |
| Summit, cutting 14 feet; grade | 57·7 | 1693 |
| St. Louis River Station, bed of river, 1,594; grade | 62·1 | 1607 |
| Partridge River, bed, 1,499; grade | 65·3 | 1514 |
| Okwanim | 70·2 | 1494 |
| Beaver Dam Creek here, bed, 1,481; grade | 70·2 | 1494 |
| Summit, cutting 7 feet; grade | 72·2 | 1536 |
| Mesaba Creek, bed, 1,479; grade | 73·7 | 1486 |
| Mesaba Heights Station, cutting 7 feet; grade | 75·3 | 1604 |
| Embarras River, bed, 1,421; grade | 80·4 | 1440 |
| Summit, cutting 23 feet; grade | 84·9 | 1484 |
| West Two Rivers, bed, 1,414; grade | 89·4 | 1424 |
| West Two Rivers, bed, 1,401; grade | 89·7 | 1413 |
| Summit, cutting 10 feet; grade | 90·4 | 1439 |
| East Two Rivers, bed, 1,374; grade | 91·8 | 1384 |
| Breitung Mine Station, Tower yard | 94·0 | 1424 |
| Tower, about | 95·7 | 1400 |
| Vermilion Lake, water | 95·7 | 1357 |

WISCONSIN CENTRAL RAILROAD (THE PART IN MINNESOTA).

[From the Fifteenth Annual Report of the Geological and Natural History Survey of Minnesota, 1886, pp. 429, 430. Corrected by uniform subtraction of 39 feet, which is here made, to agree with the St. Paul and Duluth Railroad, and with elevations of the St. Croix River determined by United States engineers.]

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. Paul, union depot | 0·0 | 703 |
| Junction with the St. Paul and Duluth Railroad, Gladstone | 5·1 | 899 |
| Castle | 8·6 | 986 |
| Long Lake, water, 936; grade | 10·3 | 951 |
| Four Lakes Station | 10·9 | 966 |
| Summit, cutting 11 feet; grade | 12·2 | 1035 |
| Crossing the Stillwater Branch, St. Paul and Duluth Rail- | | |
| road | 14·5 | 978 |
| Carnelian Lake, water, 873; grade | 20·9 | 881 |
| Arcola | 23·1 | 878 |
| St. Croix River, bed, 666; ordinary low stage of water, | | |
| 676; extreme low and high water, 670-689; grade | 25·5 | 755 |

CHICAGO, BURLINGTON AND NORTHERN RAILROAD (THE PART IN MINNESOTA).

[From profile in the office of Charles C. Upham, engineer, St. Paul. Agreeing with the elevations of the Mississippi River at St. Paul and Hastings, and of the St. Croix River at Prescott, determined by United States engineers.]

| | From Minneap- olis. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Minneapolis, union depot | 0·0 | 810 |
| St. Paul, union depot | 10·7 | 703 |
| Mississippi River here, low and high water | 10·7 | 683-702 |
| Dayton Bluff | 12·4 | 707 |
| Newport | 18·8 | 748 |
| Crossing the River division, Chicago, Milwaukee and St. | | |
| Paul Railway | 18·9 | 748 |
| Summit, natural surface and grade | 21·1 | 756 |
| Curry | 26·5 | 696 |
| Mississippi River, beside this railroad about 1½ miles | | |
| above Hastings, ordinary low stage of water, 674; | | |
| extreme low and high water | 29·5 | 671·6-690·7 |
| Crossing the River division, Chicago, Milwaukee and St. | | |
| Paul Railway | 30·6 | 692 |
| St. Croix Junction | 30·7 | 692 |
| Crossing the Stillwater Branch, Chicago, Milwaukee and | | |
| St. Paul Railway | 30·9 | 695 |
| Point Douglas | 32·7 | 708 |
| St. Croix River, bed, 650; ordinary stage of water, 672; | | |
| extreme low and high water, 667-687; grade | 33·4 | 700 |
| Prescott | 33·6 | 700 |

MINNEAPOLIS, SAULT STE. MARIE AND ATLANTIC RAILWAY.

[From W. W. Rich, engineer, Minneapolis.]

Referring this profile to sea level by the elevation of Lake Superior, 602 feet, it is found to be 3 feet too low at Minneapolis. From Minneapolis to the third crossing of the South Fork of Beaver Brook, at 71·8 miles, the elevations here given accord with the accepted elevations of St. Paul and Minneapolis; and thence eastward, namely, from Turtle Lake Station (which agrees within 1 foot with the Chicago, St. Paul, Minneapolis and Omaha Railway) to Sault Ste. Marie, they accord with that of Lake Superior.

MINNEAPOLIS, SAULT STE. MARIE AND ATLANTIC RAILWAY—Continued.

| | From Minneap- olis. | Above the sea. |
|---|------------------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Minneapolis, union depot..... | 0-0 | 810 |
| Same, depot of this railway, Fourth avenue and Second street northwest..... | 0-5 | 826 |
| Mississippi River at bridge of St. Paul and Northern Pacific Railroad in the north part of Minneapolis, used also by this railway, river bed, 783; low and high water, 794-803; grade..... | 1-8 | 825 |
| Crossing the St. Paul, Minneapolis and Manitoba Railway..... | 3-2 | 847 |
| Minneapolis shops..... | 3-7 | 847 |
| Sandy Lake, water, 838; grade..... | 3-9 | 851 |
| Summit on line between Anoka and Ramsey Counties, cutting 8 feet; grade..... | 5-9 | 950 |
| Wilson..... | 6-7 | 933 |
| New Brighton..... | 8-1 | 920 |
| Maryland Park..... | 9-6 | 926 |
| Island Lake, water, 942; grade..... | 10-7 | 950 |
| Vadnais Park..... | 12-7 | 898 |
| Summit, cutting 13 feet; grade..... | 15-4 | 946 |
| Outlet of White Bear Lake, water (5 feet below the lake), 919; grade..... | 18-4 | 928 |
| Bald Eagle Junction, at crossing of the St. Paul and Duluth Railroad..... | 18-5 | 929 |
| Garden Place..... | 19-1 | 932 |
| Pine Lake, water, 943; grade..... | 21-0 | 948 |
| Summit, filling 5 feet; grade..... | 23-2 | 1011 |
| Withrow..... | 24-1 | 980 |
| Carnelian Creek, bed, 930; grade..... | 27-9 | 951 |
| Maple Island..... | 28-6 | 961 |
| Summit, grade..... | 29-3 | 978 |
| Creek, bed, 924; grade..... | 30-0 | 955 |
| Marine..... | 33-6 | 927 |
| Otisville..... | 37-2 | 788 |
| St. Croix River, bed, 670; low water, 680; extreme high water, 697; grade..... | 39-3 | 706 |
| Bridge near Buttermilk Falls, bed of creek, 683; grade..... | 40-9 | 728 |
| Osceola..... | 43-2 | 809 |
| Godfrey Junction, St. Croix Falls Branch..... | 48-1 | 950 |
| Switch of the St. Croix Falls Branch..... | 48-2 | 954 |
| On this branch: | | |
| Summit, grade..... | 50-4 | 1028 |
| St. Croix Falls..... | 52-2 | 920 |
| On the main line east from Godfrey Junction: | | |
| Summit, cutting 14 feet; grade..... | 49-4 | 984 |
| Nye..... | 52-6 | 955 |
| Sucker Creek, bed, 1,010; water, 1,012; grade..... | 58-8 | 1040 |
| Deronda..... | 59-9 | 1066 |
| Bear Trap Lake, water, 1,038; grade..... | 60-6 | 1056 |
| Amery..... | 63-2 | 1070 |
| Apple River, bed 1,051; low and high water, 1,055-1063; grade..... | 63-4 | 1070 |
| Beaver Brook, first crossing, water, 1,067; grade..... | 65-1 | 1085 |
| East Lincoln..... | 65-6 | 1100 |
| Beaver Brook, second crossing, water, 1,083; grade..... | 66-3 | 1103 |
| Gregory (a summit of grade)..... | 68-2 | 1132 |
| South Fork of Beaver Brook, first crossing, water, 1,115; grade..... | 69-9 | 1122 |
| Same, second crossing, water, 1,132; grade..... | 71-0 | 1148 |
| Same, third crossing, water, 1,140; grade..... | 71-8 | 1151 |
| Turtle Lake Station (a summit of grade), at crossing of the Chicago, St. Paul, Minneapolis and Omaha Rail- way..... | 76-0 | 1258 |
| Lightning Creek, bed, 1,145; water, 1,147; top of bank, 1,172; grade..... | 82-1 | 1169 |
| Hay River, bed, 1,136; water, 1,139; bank, 1,187 grade.. | 83-1 | 1179 |

MINNEAPOLIS, SAULT STE. MARIE AND ATLANTIC RAILWAY—Continued.

| | From Minneap- olis. | Above the sea. |
|---|------------------------|----------------|
| | Miles. | Feet. |
| Barron..... | 91.4 | 1111 |
| Yellow River, bed, 1,082; low and high water, 1,085- 1,096; top of bank and grade..... | 91.9 | 1104 |
| Menominee River, bed, 1,065; water, 1,069; grade..... | 94.8 | 1095 |
| Pokegama Creek, bed, 1,052; top of bluff, 1,096; grade..... | 100.4 | 1077 |
| Canton..... | 101.0 | 1101 |
| Summit, cutting 15 feet; grade..... | 110.7 | 1303 |
| Weyerhaeuser..... | 114.4 | 1297 |
| Bruce..... | 121.6 | 1098 |
| Chippewa River, bed, 1,057; low and high water, 1,062- 1,076; top of bank, 1070; grade..... | 122.7 | 1082 |
| Flambeau Falls..... | 130.0 | 1142 |
| Flambeau River, bed, 1,082; low water, 1,092-1,097; west bank, 1,123; east bank, 1,150; grade..... | 131.2 | 1123 |
| Deer Tail..... | 135.9 | 1221 |
| Main Creek, bed, 1,270; water, 1,272; bank 1,300; grade.. | 144.5 | 1297 |
| Ingram..... | 144.8 | 1301 |
| Hawkins..... | 149.4 | 1365 |
| Willard..... | 159.0 | 1493 |
| North Branch of Jump River, bed, 1,420; water, 1,422; top of bank, 1,470; grade..... | 161.5 | 1449 |
| Prentice..... | 170.9 | 1551 |
| Summit, filling 2 feet; grade (highest on this railway).. | 179.7 | 1696 |
| Bradley..... | 197.8 | 1473 |
| Tomahawk River, bed, 1,440; low and high water, 1,442- 1,448; bank, 1,470; grade..... | 198.2 | 1467 |
| Big Rice Creek, bed, 1,444; water, 1,450; bank, 1,477; grade..... | 201.7 | 1468 |
| Wisconsin River, bed, 1,525; water, 1,528; bank, 1,545; grade..... | 216.7 | 1552 |
| Rhineland..... | 217.0 | 1555 |
| Pennington..... | 227.6 | 1635 |
| Gagen..... | 231.4 | 1645 |
| Summit, cutting 10 feet; grade..... | 235.2 | 1691 |
| Peshtigo River, first crossing, bed, 1,618; water, 1,620; bank, 1,646; grade..... | 242.8 | 1640 |
| Same, second crossing, bed, 1,540; water, 1,542; bank, 1,546; grade..... | 247.2 | 1552 |
| Armstrong Creek Station..... | 265.8 | 1427 |
| Pike River, bed, 1,209; water, 1,212; bank, 1,262; grade.. | 275.6 | 1252 |
| Pike River Station..... | 276.4 | 1222 |
| Pembine..... | 289.7 | 968 |
| South Branch of Pembine River, bed, 808; water, 810; grade..... | 295.1 | 827 |
| Van Horne..... | 296.4 | 807 |
| North Branch of Pembine River, bed, 797; water, 799; grade..... | 297.4 | 824 |
| Menominee River, bed, 787; low and high water, 791- 797; grade..... | 301.9 | 816 |
| Menominee River Station..... | 302.2 | 816 |
| Meyer..... | 305.7 | 920 |
| Hermansville..... | 311.0 | 887 |
| Cedar River, bed, 850; low and high water, 852-856; grade..... | 314.7 | 861 |
| Springer..... | 314.9 | 862 |
| Eustis..... | 325.3 | 916 |
| Ford River, bed, 695; low and high water, 697-704; grade..... | 330.5 | 716 |
| Newhall..... | 330.9 | 709 |
| Escanaba River, bed, 587; low and high water, 596- 606; grade..... | 338.9 | 636 |
| Flat Rock..... | 339.3 | 623 |
| Gladstone..... | 342.8 | 612 |

MINNEAPOLIS, SAULT STE. MARIE AND ATLANTIC RAILWAY—Continued.

| | From Minne- apolis. | Above the sea. |
|--|------------------------|----------------|
| | Miles. | Feet. |
| Water in Hammer's Slough, near its outlet to Little Bay de Noc..... | 343.8 | 584 |
| Masonville..... | 348.0 | 593 |
| White Fish River, bed, 577; water, 583; grade..... | 350.1 | 596 |
| Ogontz River, bed, 607; water, 609; grade..... | 359.0 | 617 |
| Ogontz..... | 359.5 | 620 |
| Sturgeon River, bed, 596; water, 603; grade..... | 362.7 | 617 |
| Sturgeon River Station..... | 363.1 | 623 |
| Van Winkle..... | 369.3 | 592 |
| Fishdam River, bed, 583; low and high water, 586-590; grade..... | 369.7 | 595 |
| Cook's Mill..... | 375.1 | 702 |
| Delta Junction..... | 380.7 | 667 |
| South Manistique..... | 384.8 | 596 |
| Manistique..... | 386.7 | 613 |
| Manistique River, bed, 598; low and high water, 605-609; grade..... | 387.0 | 616 |
| Gulliver Lake Station..... | 398.0 | 626 |
| McDonald Lake Station..... | 400.7 | 622 |
| Pike Lake Station..... | 411.1 | 749 |
| Scott's Point Station (a summit of grade)..... | 414.5 | 772 |
| Kennedy..... | 422.1 | 675 |
| Mille Coquins River, bed, 611; low and high water, 615-621; grade..... | 424.3 | 620 |
| Mille Coquins Station..... | 425.0 | 632 |
| Naubinway Junction..... | 428.9 | 725 |
| Gilchrist..... | 431.6 | 779 |
| Black River, bed, 768; water, 770; grade..... | 432.9 | 784 |
| Summit, cutting 6 feet; grade..... | 438.1 | 886 |
| Hall's Siding..... | 441.6 | 864 |
| Trout Lake Station..... | 449.8 | 836 |
| Alexander..... | 458.2 | 815 |
| Pine River, bed, 621; water, 625; grade..... | 469.2 | 678 |
| North Branch of Pine River, bed, 623; water, 629; grade..... | 470.4 | 682 |
| Pine River Station..... | 470.6 | 683 |
| Gravel Pit, cutting 14 feet; grade..... | 475.8 | 753 |
| Dafter..... | 483.3 | 695 |
| Leland..... | 487.4 | 656 |
| Sault Ste. Marie, water in canal, level from Lake Superior..... | 494.1 | 602 |

MINNEAPOLIS AND PACIFIC RAILWAY.

[From profile in the office of W. W. Rich, engineer, Minneapolis. Referred to sea level at Minneapolis, and found to agree exactly or closely with the numerous intersecting railways along its whole extent.]

| | | |
|--|------|------|
| Minneapolis, union depot..... | 0.0 | 810 |
| Same, depot of this and the Minneapolis, Sault Ste. Marie and Atlantic Railways..... | 0.5 | 826 |
| Shingle Creek, bed, 815; water in mill pond, 827; grade..... | 3.8 | 832 |
| Camden Place..... | 3.8 | 832 |
| Crossing the St. Paul, Minneapolis and Manitoba Railway..... | 7.3 | 872 |
| Crystal..... | 7.7 | 877 |
| Staffordsville..... | 11.5 | 927 |
| Summit, natural surface and grade..... | 14.2 | 1009 |
| Hamel..... | 16.0 | 986 |
| Loretto..... | 21.7 | 995 |
| Summit, cutting 18 feet; grade..... | 23.6 | 1011 |
| Marmion..... | 27.9 | 918 |
| South Fork of Crow River, bed, 898; water, 903; grade..... | 28.1 | 914 |
| North Fork of Crow River, bed, 896; water, 902; grade..... | 29.2 | 913 |

MINNEAPOLIS AND PACIFIC RAILWAY—Continued.

| | From Minne- apolis. | Above the sea. |
|---|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Buffalo | 37.1 | 981 |
| Trestle bridge near Lake Ramsey, 3d feet high; grade... | 44.3 | 1034 |
| Maple Lake Station | 45.0 | 1052 |
| Annandale | 51.2 | 1066 |
| South Haven | 56.1 | 1102 |
| Clearwater River, bed, 1,015; grade | 58.2 | 1080 |
| Kimball Prairie | 61.4 | 1138 |
| Summit, cutting 5 feet; grade | 64.4 | 1190 |
| Watkins | 66.8 | 1162 |
| Summit, cutting 6 feet; grade | 69.2 | 1179 |
| Depression, grade | 71.5-72.1 | 1107 |
| Eden Valley | 73.6 | 1123 |
| Summit, grade | 77.4 | 1217 |
| North Fork of Crow River, bed, 1,118; grade | 79.3 | 1164 |
| Paynesville | 82.8 | 1172 |
| North Fork of Crow River, bed, 1,142; grade | 83.1 | 1172 |
| Crossing the St. Paul, Minneapolis and Manitoba Rail- way | 84.6 | 1184 |
| Lintonville | 89.9 | 1220 |
| North Fork of Crow River, bed, 1,207; grade | 90.8 | 1218 |
| Belgrade | 98.1 | 1273 |
| Brooten | 104.8 | 1314 |
| Thorson (a summit of grade) | 112.6 | 1334 |
| Depression, grade | 113.4 | 1321 |
| East Branch of Chippewa River, bed, 1,307; grade | 115.0 | 1339 |
| Glenwood | 120.5 | 1390 |
| Crossing the Little Falls and Dakota (Northern Pacific) Railroad | 121.8 | 1415 |
| Lowry | 129.5 | 1368 |
| Farwell | 135.2 | 1339 |
| Kensington (a summit of grade) | 139.4 | 1318 |
| Chippewa River, bed, 1,184; grade | 144.0 | 1202 |
| Hoffman | 145.7 | 1246 |
| Water course tributary to the Pomme de Terre River, bed, 1,174; grade | 150.5 | 1230 |
| Pomme de Terre River, bed, 1,145; water, 1,147; grade... | 152.9 | 1163 |
| Barrett | 153.7 | 1165 |
| Summit, natural surface and grade | 156.2 | 1227 |
| Crossing the St. Paul, Minneapolis and Manitoba Rail- way | 159.5 | 1201 |
| Elbow Lake Station | 160.4 | 1210 |
| Wendell | 167.2 | 1148 |
| Herman shore of Lake Agassiz, crest of escarpment of till, 1,089; grade | 170.1 | 1081 |
| Same, ridge of beach gravel and sand, crest, 1,082; grade. (Descent eastward from this beach ridge, 7 feet; westward, 6 feet in 15 rods, then nearly level 8 rods, followed by a descent of 16 feet in 18 rods, to 1,060 feet.) | 170.3 | 1073 |
| Norcross Beach of Lake Agassiz, crest, 1,049; grade | 171.3 | 1048 |
| Tintah Beaches, crests (inconspicuous) | 176.0-176.5 | 1012-1010 |
| Nash | 177.1 | 1000 |
| Crossing the Breckenridge line of the St. Paul, Minneap- olis and Manitoba Railway | 179.0 | 991 |
| Elliott | 180.4 | 991 |
| South Branch of Rabbit River, bed, 976; grade | 180.9 | 991 |
| Tenney | 184.2 | 990 |
| Campbell Beach deposits of Lake Agassiz, crests (incon- spicuous) | 186.9-187.5 | 983-980 |
| Bois des Sioux River, bed, 963; grade | 189.4 | 973 |
| Campbell Beaches, crests (inconspicuous), 979-984; grade. | 190.9-191.4 | 981-985 |
| Fairmount | 191.4 | 985 |
| Crossing the Fargo and Southern (Chicago, Milwaukee and St. Paul) Railway | 191.7 | 985 |

MINNEAPOLIS AND PACIFIC RAILWAY—Continued.

| | From Minne- apolis. | Above the sea. |
|---|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Beach, crest, 993; grade | 195·1 | 992 |
| (Descent eastward from the crest, 5 feet in 25 rods; westward, 5 feet in 15 rods.) | | |
| Oswald | 197·5 | 989 |
| Small dunes, crests, 995-997; grade | 199·8-200·1 | 997 |
| Hankinson | 205·8 | 1070 |
| Milnor Beaches of Lake Agassiz (inconspicuous), crests and grade the same | 207·0-207·3 | 1084-1085 |
| Crossing the St. Paul, Minneapolis and Manitoba Rail- way | | |
| Stiles | 208·3 | 1089 |
| Summit, cutting 7 feet; grade | 213·0 | 1131 |
| Lidgerwood | 214·5 | 1137 |
| Alicia | 217·9 | 1092 |
| Grass Creek, bed, 1,118; grade | 223·7 | 1157 |
| Ransom | 228·0 | 1130 |
| Wild Rice River, bed, 1,112; water, 1,117; grade | 229·2 | 1131 |
| Perry | 229·5 | 1127 |
| Forman | 234·9 | 1205 |
| Towanda (a summit of grade) | 240·9 | 1251 |
| Crossing the Chicago, Milwaukee and St. Paul Railway | 246·3 | 1318 |
| Summit, grade (2 feet above the natural surface, which is fine sand in dunes 2 to 3 feet high) | 248·0 | 1298 |
| Nicholson | 248·9 | 1322 |
| Summit, grade (1 foot below the natural surface, which is clayey loam) | 252·2 | 1309 |
| Babcock | 253·8 | 1344 |
| Summit at a pass through a belt of morainic hills, cut- ting 4 feet; grade | 258·3 | 1324 |
| Oakes | 261·6 | 1343 |
| Crossing the Chicago and Northwestern Railway | 263·7 | 1322 |
| James River, about 100 feet wide, with no perceptible current, bed (clay), 1,286; low and high water, 1,289- 1,295; grade | 263·9 | 1321 |
| Clement | 264·9 | 1298 |
| Fullerton | 271·5 | 1394 |
| Maple River, bed, 1,420; low and high water, 1,421- 1,425; grade | 280·6 | 1442 |
| Boynnton | 284·4 | 1435 |
| Crossing the Chicago, Milwaukee and St. Paul Railway near Monango | 287·4 | 1497 |
| South Fork of Maple River, bed, 1,475; water, 1,478; grade | 288·4 | 1505 |
| | 288·6 | 1501 |

GREAT NORTHERN, (formerly ST. PAUL, MINNEAPOLIS AND MANITOBA)
RAILWAY SYSTEM.¹

[From profiles in the office of N. D. Miller, engineer, St. Paul.]

ST. PAUL TO MINNEAPOLIS.

[Referred to sea level by the elevation of the Mississippi River at St. Paul, determined by United States engineers.]

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. Paul, extreme low and high water of the Mississippi River | 0·0 | 683-702 |
| St. Paul, union depot | 0·0 | 703 |
| Under the Mississippi Street Bridge | 1·4 | 797 |
| Under the Como Avenue Bridge | 2·8 | 857 |

¹The name of this railroad system was changed in 1890.

GREAT NORTHERN RAILWAY SYSTEM—Continued.

ST. PAUL TO MINNEAPOLIS—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Como | 2.9 | 858 |
| Hamline (a summit of grade) | 5.0 | 926 |
| Highest natural surface cut at 5.1, 5.4, and 5.8 miles, in each place | 5.1-5.4-5.8 | 938 |
| St. Anthony Park | 6.9 | 878 |
| Under the University Avenue Bridge | 8.7 | 813 |
| East Minneapolis | 9.4 | 803 |
| Stone arch bridge, grade | 9.5-9.8 | 803 |
| Tail-race from Pillsbury A mill, under east end of this bridge, water | 9.5 | 739 |
| Mississippi River, main stream under this bridge | 9.6-9.75 | 743 |
| Same, crest of St. Anthony's Falls, under west end of this bridge, ordinary stage of water held by dams, 794; highest stage of flowage by dams, 796; highest stage of floods, 802 | 9.9 | 794-802 |
| Limestone ledge under west end of bridge, 15 feet thick, brink of original fall and foundation of dam | 9.85 | 765-780 |
| (This coincides with the vertical fall, 15 or 16 feet, before the dam was built. The fall down the "apron" of the dam is about 30 feet, 794-764.) | | |
| Minneapolis depot | 10.3 | 810 |
| Crossing of Washington avenue (former site of depot) .. | 10.8 | 830 |

MAIN LINE, FROM ST. PAUL, BY ST. CLOUD, FERGUS FALLS, CROOKSTON, AND GRAND FORKS, TO GREAT FALLS.

[Referred to sea level at St. Paul and Minneapolis, and found to agree exactly with connecting railways at East St. Cloud, Sauk Center, Fergus Falls, and Glyndon.]

The profile from Glyndon by Crookston to Grand Forks gives an elevation of Grand Forks 5 feet higher than the profile of the line from Breckenridge by Moorhead and Grand Forks to Neche. Leveling by United States engineers along the Red River, the connections with branches of the Canadian Pacific Railway on the international boundary at Emerson and Gretna, the survey from Carman eastward to Leach Lake, and the agreement of the Dakota division of this main line with the Jamestown and Northern Railroad at Devil's Lake, all attest the correctness of the lower elevation of Grand Forks, and show that the corresponding subtraction of 5 feet should be applied to this line at least from Carman northward, which is here done. Along the distance between Glyndon and Carman a subtraction of 2 feet is made in its southern half, extending to Ada, and of 3 feet thence northward.

With the accepted elevation of Grand Forks, the profile thence westward agrees exactly at Larimore with the lines from Everest and the Northern Pacific Railroad by way of Mayville and Portland; and the same elevation of Devil's Lake is obtained by leveling from this railway at Devil's Lake Station as from the Jamestown and Northern Railroad at Minnewaukon.

From Devil's Lake to Great Falls the profile consists of several series of leveling, referred to separate data. These are here reduced to sea level, and the elevation thus obtained at Great Falls is found to agree exactly with leveling to that place from the Northern Pacific Railroad at Helena.

| | From St. Paul. | Above the sea. |
|-------------------------------------|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. Paul | 0.0 | 703 |
| Minneapolis | 10.3 | 810 |
| Fridley (formerly Manomin) | 16.3 | 844 |
| Rice Creek, water, 817; grade | 16.5 | 843 |
| Coon Creek, water, 828; grade | 20.7 | 854 |
| Anoka | 26.6 | 879 |
| Rum River, water, 841; grade | 27.2 | 862 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Itasca | 33.7 | 887 |
| Elk River Station | 38.5 | 892 |
| Junction of the Princeton Branch | 39.2 | 905 |
| Elk River, water, 892; grade | 43.0 | 906 |
| Bailey's | 43.6 | 917 |
| Big Lake Station | 47.6 | 936 |
| Becker | 55.5 | 973 |
| Clear Lake Station | 62.5 | 993 |
| Haven | 68.6 | 1014 |
| East St. Cloud | 73.6 | 1026 |
| (From this station the St. Paul and Northern Pacific Railroad, which thus far lies side by side with this, continues north along the east side of the Mississippi to Brainerd.) | | |
| Mississippi River, low water before the dam was built, 965; same, as now raised by the dam, 975; grade | 74.2 | 1032 |
| St. Cloud | 74.6 | 1037 |
| Same, junction with Clearwater Branch | 75.0 | 1040 |
| St. Cloud Junction, with Willmar Branch | 76.5 | 1048 |
| Sauk River, bed, 1,033; water, 1,035; grade | 78.1 | 1050 |
| St. Joseph | 82.1 | 1088 |
| Watab River, water, 1,058; grade | 82.7 | 1075 |
| Collegeville | 84.9 | 1094 |
| Summit, cutting 12 feet; grade | 87.6 | 1150 |
| Avon | 90.3 | 1131 |
| South Branch of Two Rivers, water, 1,137; grade | 94.5 | 1144 |
| Albany | 96.3 | 1201 |
| Summit, cutting 5 feet; grade | 98.8 | 1250 |
| Getchell Creek, water, 1,191; grade | 101.3 | 1203 |
| Freeport (formerly Oakes), a summit of grade | 102.6 | 1240 |
| Sauk River, bed, 1,168; water, 1,172; grade | 106.3 | 1185 |
| Melrose | 108.5 | 1211 |
| Sauk River, water, 1,201; grade | 110.8 | 1213 |
| Summit, cutting 11 feet; grade | 114.2 | 1277 |
| Sauk River, bed, 1,209; low and high water, 1,213-1,223; grade | 115.8 | 1237 |
| Sauk Center Station, and crossing the Little Falls and Dakota (Northern Pacific) Railroad | 116.8 | 1255 |
| Same, junction with Sauk Center and Northern Branch | 117.3 | 1257 |
| Hazel Creek, water, 1,236; grade | 117.8 | 1257 |
| Summit, grade | 120.7 | 1330 |
| Ashley Creek, water, 1,277; grade | 121.8 | 1289 |
| Silver Creek, water, 1,272; grade | 122.5 | 1281 |
| West Union | 124.6 | 1337 |
| Osakis | 130.5 | 1343 |
| Osakis Lake, water, about | 130.5 | 1310 |
| Summit, cutting 7 feet; grade | 132.5 | 1408 |
| Nelson | 136.1 | 1369 |
| Summit, cutting 7 feet; grade | 137.9 | 1425 |
| Outlet from Lake Victoria to Lake Geneva, water, 1,355; grade | 139.1 | 1373 |
| Summit, cutting 14 feet; grade | 140.3 | 1416 |
| Alexandria | 141.5 | 1391 |
| Lakes Winona and Agnes, near Alexandria, about | | 1365 |
| Long Prairie River, flowing southward, above its entrance into Mill Lake, water, 1,349; grade | 144.5 | 1367 |
| Garfield | 148.3 | 1417 |
| Summit, cutting 13 feet; grade, highest on this railway in Minnesota | 149.8 | 1451 |
| Aldrich Lake, water, 1,391; grade | 151.9 | 1404 |
| Brandon | 154.0 | 1388 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

| | From St. Paul. | Above the sea. |
|---|-----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Chippewa River, water, 1,339; grade | 157.1 | 1369 |
| Evansville, junction of branch to Tintah | 159.2 | 1353 |
| Summit, cutting 30 feet; grade | 160.1 | 1378 |
| Outlet from Lake Christina to Pelican Lake, water (ap- proximately the same as these lakes), 1,215; grade..... | 165.6 | 1227 |
| Interlaken | 165.9 | 1230 |
| Ashby | 168.3 | 1293 |
| Summit, cutting, 10 feet; grade | 168.35 | 1296 |
| Pelican Creek, water, 1,238; grade | 169.6 | 1251 |
| Dalton (a summit of grade) | 175.8 | 1359 |
| Pomme de Terre River, bed, 1,225; water, 1,226; grade .. | 178.5 | 1261 |
| Parkdale | 179.3 | 1276 |
| Sand Lake, water, 1,187; grade | 185.7 | 1188 |
| Summit, cutting 13 feet; grade | 186.0 | 1197 |
| Crossing the Northern Pacific, Fergus and Black Hills Railroad | 186.3 | 1194 |
| Fergus Falls, freight depot | 186.5 | 1189 |
| Red River, water, 1,178; grade | 186.6 | 1190 |
| Fergus Falls, passenger depot | 187.2 | 1210 |
| Summit, natural surface and grade | 190.0 | 1237 |
| Pelican River, water, 1,151; grade | 191.8 | 1173 |
| Carlisle | 195.2 | 1226 |
| Same, junction of branch to Elizabeth | 195.5 | 1219 |
| On this branch: | | |
| Summit, cutting 8 feet; grade | 197.2 | 1282 |
| Summit, cutting 3 feet; grade | 197.9 | 1284 |
| Elizabeth | 199.0 | 1257 |
| On the main line northwestward: | | |
| Lake, water, 1,220; grade | 198.8 | 1225 |
| Rothsay | 203.8 | 1190 |
| Lawndale, crest of Upper or Herman Beach of Lake Agas- siz, excavated for ballast along a spur track extending a third of a mile north from the tank, 1,092-1,095; grade at tank | 209.5 | 1089 |
| Small beach deposits, crest and grade the same | 210.6 and 210.7 | 1067 |
| (Again small beach deposits are crossed at 211.2, 211.3, and 211.5 miles, with crests respectively at 1,057, 1,054, and 1,051 feet.) | | |
| Tintah Beach of Lake Agassiz, crest and grade the same .. | 217.6 | 1027 |
| Barnesville | 217.9 | 1020 |
| Willow River (more commonly called Whiskey Creek), bed, 994; grade (at junction of line to Breckenridge) .. | 218.3 | 1009 |
| Junction of line to Moorhead | 218.9 | 1000 |
| Sieber's Creek, water, 979; grade | 220.6 | 989 |
| Buffalo Creek, tributary to the South Branch of Buffalo River, water, 957; grade | 223.2 | 963 |
| Downer | 225.7 | 965 |
| Glyndon, station and crossing the Northern Pacific Rail- road | 235.3 | 925 |
| Buffalo River, bed, 903; water, 908; grade | 236.9 | 921 |
| Averill | 241.8 | 917 |
| Felton | 249.6 | 915 |
| Borup | 254.9 | 911 |
| Wild Rice River, bed, 895; water, 900; grade | 262.6 | 909 |
| Marsh River, water | 264.6 | 890 |
| Ada | 265.2 | 906 |
| Long Lake, former channel of the Wild Rice River, then passing westward in the present course of Marsh River, water | 265.5 | 901 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Lockhart | 275.0 | 893 |
| Rolette | 276.7 | 892 |
| Beltrami | 282.0 | 901 |
| Sand Hill River, water, 895; grade | 282.5 | 903 |
| Russia | 288.0 | 892 |
| Kittson | 292.3 | 885 |
| Burnham Creek, water, 868; grade | 293.0 | 882 |
| Carman, junction of Fosston Branch | 298.0 | 877 |
| Red Lake River, water, 833; grade | 299.0 | 863 |
| Crookston | 299.3 | 863 |
| Bluff north of Red Lake River, natural surface, 886; grade | 299.7 | 876 |
| Junction with line to St. Vincent | 300.5 | 885 |
| Beach of Lake Agassiz, excavated for ballast, crest, 882; grade | 302.8 | 879 |
| Fisher | 310.1 | 852 |
| Grand Marais Slough (former channel of Red Lake River), bed, 830; grade | 312.1 | 846 |
| Mallory | 317.5 | 837 |
| East Grand Forks | 323.4 | 831 |
| Red River, bed, 779; lowest stage of water in ordinary years, 784-786; highest stage in ordinary years, 800-820; extreme high water (in spring, 1882), 828; grade .. | 323.9 | 829 |
| Grand Forks, 324.5 miles from St. Paul by this line, but only 320.3 miles by way of Moorhead | 320.3 | 830 |
| Junction of line to Neche | 320.6 | 831 |
| University | 322.1 | 833 |
| Grand Forks Junction, of line to Moorhead, 317.0 miles from St. Paul by that line | 323.6 | 836 |
| Salt Cooley, bed, 832; grade | 330.1 | 850 |
| Ojata | 331.2 | 858 |
| Beginning of ascent westward, natural surface, 862-863; grade | 333.6 | 866 |
| Crest of escarpment eroded in till, a beach of Lake Agassiz | 333.9 | 880 |
| Crest of next beach, a typical gravel ridge 10 feet above the surface eastward, 894; grade | 335.7 | 893 |
| Emerado | 335.9 | 898 |
| McCauleyville Beach, crest, 991; grade | 340.8 | 985 |
| (This beach ridge is about 50 rods wide (including the slopes); the descent from its crest is 18 feet to the east and 8 feet to the west.) | | |
| Campbell Beach, crest, 1,014; grade | 341.2 | 1003 |
| (This beach ridge is about 60 rods wide; the descent from its crest is 23 feet to the east and 9 feet to the west.) | | |
| Arvilla | 342.0 | 1017 |
| Lower Tintah Beach, crest | 343.7 | 1055 |
| Upper Tintah Beach, crest | 344.1 | 1070 |
| Lower Norcross Beach, crest | 344.6 | 1080 |
| Upper Norcross Beach, crest | 345.0 | 1092 |
| (These four beach ridges are small, being from 20 to 30 rods wide and 4 to 6 feet high.) | | |
| Herman (d) Beach, represented by two or three such small beach ridges, crests | 346.3-346.6 | 1118-1123 |
| Herman (c) Beach, second ridge, crest and grade the same. (This beach ridge is 50 or 60 rods wide, and rises 9 feet above the land on each side.) | 347.5 | 1134 |
| Herman (c) Beach, first ridge, crest, 1,133; grade (at junction of line to Mayville and Portland) | 347.8 | 1130 |
| (This beach ridge is 40 rods wide, and rises 7 feet above the land on each side.) | | |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Larimore, 346·7 miles from St. Paul by way of Portland, 345·9 miles by Mayville..... | 348·2 | 1134 |
| (The next 4 miles of this line are nearly level, with very slight undulations and small water courses, the elevation all the way being 1,130, or 2 or 3 feet above or below this.) | | |
| Park River Junction, of line to Park River and Langdon. | 350·6 | 1133 |
| Herman (b) Beach, crest and grade the same..... | 352·4 | 1146 |
| (This beach ridge is about 20 rods wide (including the slopes); the descent from its crest is 10 feet to the east and 4 feet to the west.) | | |
| Herman (a) Beach, marking the highest shore of Lake Agassiz, crest, 1,162; grade | 352·8 | 1158 |
| (This beach ridge is of similar size with the last. The next 12 miles westward have a very uniform and continuous ascent, with no evidences of shore lines.) | | |
| Niagara..... | 362·1 | 1440 |
| Top of westward ascent, natural surface, 1,525; grade ... | 365·0 | 1519 |
| Lake, water, 1,515; grade | 365·1 | 1520 |
| Lake, water, 1,516; grade..... | 366·4 | 1518 |
| Petersburg | 368·4 | 1519 |
| (The surface in this vicinity is moderately undulating, with its crests 10 to 15 feet above the hollows and lakelets.) | | |
| Slough, water, 1,522; grade..... | 370·8 | 1525 |
| Michigan City | 374·1 | 1517 |
| (The highest undulations crossed within 4 miles east and the same distance west from Michigan City rise only to 1,530 feet.) | | |
| Mapes | 378·9 | 1526 |
| Depression, called "low bottom land," natural surface, 1,500-1,503; grade | 382·0-382·6 | 1505 |
| Lakota | 384·7 | 1514 |
| Summit, cutting 3 feet; grade (highest between the Red River and Devil's Lake) | 385·6 | 1532 |
| Bartlett | 388·4 | 1529 |
| (Thence an undulating surface slowly falls to 1,465-1,475 at 401 miles. In the next 8 miles west to Devil's Lake the surface continues very undulating, with its crests 10 to 25 feet above the depressions, nowhere rising so high as 1,500 feet.) | | |
| Devil's Lake Station | 409·0 | 1464 |
| Leveling from this station, for the U. S. Geological Survey, gives the following: | | |
| Devil's Lake, water (August 8, 1887) | | 1431·6 |
| Same, lowest and highest stages during the years 1880-1889 | | 1430-1434 |
| Stump Lake, water (August 12, 1887)..... | | 1417 |
| (From a survey in June, 1887, for proposed water-works for the city of Devil's Lake, the elevation of Sweetwater Lake at that date was ascertained to be 1,468 feet. Its lowest and highest stages are approximately 1,466-1,470 feet.) | | |
| Grand Harbor..... | 416·1 | 1454 |
| Mauvaise Coulée, bed, 1,441; high water, 1,447; grade... | 427·4 | 1450 |
| Church's Ferry, junction of the Cando Branch | 427·9 | 1458 |
| Summit, natural surface and grade..... | 434·1 | 1527 |
| Leeds..... | 439·3 | 1514 |
| Battle Creek, bed, 1,531; grade | 442·8 | 1583 |
| York | 445·5 | 1612 |
| Summit, cutting 5 feet; grade | 447·4 | 1642 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Knox | 451.6 | 1605 |
| Broken Bone Summit, cutting 4 feet; grade | 454.6 | 1655 |
| Pleasant Lake Station | 457.0 | 1603 |
| Alkali flats, grade | 458.5-459.5 | 1570 |
| Rugby, junction of the Bottineau Branch | 465.9 | 1561 |
| Depression, "dry slough," natural surface, 1,484-85; grade | 472.7-473.6 | 1499 |
| Berwick | 477.7 | 1492 |
| Towner | 485.0 | 1475 |
| Mouse (or Souris) River, bed, about 1,441; high water, 1,455; grade | 486.4 | 1458 |
| Denbigh | 491.2 | 1485 |
| Granville | 504.7 | 1503 |
| Summit, grade (1 foot above the natural surface) | 511.2 | 1544 |
| Norwich | 512.6 | 1526 |
| Summit, natural surface and grade | 519.5 | 1630 |
| Mouse River, bed, 1,532; grade | 526.5 | 1554 |
| Minot | 526.9 | 1557 |
| Cut, 35 feet deep; grade | 531.3 | 1681 |
| (From 529 to 536.9 miles the surface ascending west- ward is very uneven, having frequent cuts and fills of 25 to 40 feet.) | | |
| Gassman Coulee, bed, 1,568; bottom land, 1,585; grade .. | 531.7 | 1682 |
| (This is crossed by a trestle 95 to 100 feet high and 1,000 feet long.) | | |
| Top of steep westwardly ascending grade (also the nat- ural surface) | 536.9 | 1847 |
| (Thence a moderately undulating surface extends to the west.) | | |
| Des Lacs | 538.6 | 1897 |
| Big Mary's Coulee, bed, 1,849; grade | 541.1 | 1925 |
| (This is crossed by a trestle 75 feet high and 400 feet long.) | | |
| Loue Tree | 544.9 | 1995 |
| Berthold | 549.7 | 2082 |
| Creek, bed, 2,172; grade | 554.2 | 2192 |
| Summit, cutting 10 feet; grade | 557.2 | 2236 |
| Wallace | 559.5 | 2182 |
| Depression, natural surface, 2,165; grade | 560.0 | 2177 |
| Delta (a summit of grade, cutting 10 feet) | 566.3 | 2258 |
| Ravine, bed, 2,133; grade | 570.7 | 2161 |
| Elton | 573.3 | 2195 |
| Stanley | 581.3 | 2252 |
| Summit, cutting 5 feet; grade | 583.6 | 2318 |
| Ross | 588.6 | 2287 |
| Manitou | 593.1 | 2275 |
| White Earth River, bed, 2,067; water, 2,070; grade | 600.2 | 2093 |
| White Earth | 600.5 | 2087 |
| West Fork of White Earth River, bed, 2,091; water, 2,096; grade | 603.1 | 2102 |
| Tioga | 610.0 | 2273 |
| Summit, cutting 9 feet; grade | 614.8 | 2347 |
| Creek, bed, 2,239; grade | 617.3 | 2272 |
| Ray | 618.3 | 2271 |
| Creek, bed, 2,236; grade | 621.0 | 2260 |
| Summit of the Coteau du Missouri, cutting 4 feet; grade (highest between Devil's Lake and the Missouri River) .. | 625.6 | 2391 |
| Wheelock | 626.1 | 2374 |
| Spring Brook Station | 634.5 | 2113 |
| Avoca | 641.7 | 1956 |
| Little Muddy Creek, North Dakota, bed, 1,826; water, 1,828; grade | 647.0 | 1854 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Missouri River at mouth of Little Muddy Creek, low and high water..... | 647·0 | 1823-1846 |
| Williston..... | 648·4 | 1854 |
| Missouri River here, low and high water..... | 648·4 | 1825-1848 |
| Missouri River, high water, 1887..... | 650·4-651·4 | 1851 |
| Cut, 46 feet deep, on the eastern boundary of the Fort Buford military reservation; grade..... | 654·1 | 1874 |
| Painted Wood Creek, bed, 1,847; grade..... | 657·6 | 1864 |
| Trenton..... | 659·7 | 1894 |
| Buford..... | 668·6 | 1944 |
| Missouri River here, at Fort Buford and mouth of the Yellowstone River, low and high water, about..... | 668·6 | 1855-1875 |
| Line between North Dakota and Montana, grade..... | 670·9 | 1908 |
| Willows..... | 677·1 | 1889 |
| Bottomland of the Missouri River here..... | 677·1 | 1875 |
| Missouri River, extreme high water, increased by ice gorge, 1881..... | 678·0 | 1890 |
| Little Muddy Creek, Montana, bed, 1,884; grade (Bridge No. 189)..... | 681·1 | 1907 |
| Same, bed, 1,905; grade (Bridge No. 195)..... | 683·0 | 1926 |
| Kilva..... | 686·0 | 1955 |
| Summit, cutting 2 feet; grade..... | 688·7 | 2000 |
| Lanark..... | 693·1 | 1976 |
| Western boundary of Fort Buford military reservation, grade..... | 693·9 | 1971 |
| Culbertson..... | 700·5 | 1913 |
| Big Muddy Creek, bed, 1,895; water, 1,901; grade..... | 705·4 | 1918 |
| Blair..... | 706·6 | 1920 |
| Missouri River, high water, 1861..... | 708·3 | 1919 |
| Calais..... | 714·9 | 1934 |
| Brockton..... | 723·3 | 1945 |
| Poplar..... | 733·8 | 1955 |
| Missouri River here, extreme low and high water..... | 733·8 | 1935-1952·5 |
| Poplar River, low and high water, 1,939-1,953; grade..... | 734·4 | 1957 |
| Chelsea..... | 742·6 | 1980 |
| Macon..... | 748·7 | 1976 |
| Wolf Point..... | 754·6 | 1995 |
| Wolf Creek, bed, 1,982; grade..... | 756·6 | 2002 |
| Missouri River, high water, 1888..... | 759·4 | 1992 |
| Oswego..... | 766·1 | 2018 |
| Lenox..... | 773·1 | 2072 |
| Kintyre..... | 778·5 | 2082 |
| Milk River Station..... | 784·5 | 2048 |
| Missouri River at mouth of Milk River, low and high water, about..... | 784·5 | 2020-2040 |
| East Fork of Big Porcupine Creek, bed, 2,033; grade..... | 788·4 | 2057 |
| Big Porcupine Creek, bed, 2,036; grade..... | 789·2 | 2058 |
| Nashua..... | 790·1 | 2060 |
| Whately..... | 798·0 | 2086 |
| Glasgow..... | 804·3 | 2087 |
| Milk River, first crossing, bed, 2,049; grade..... | 806·6 | 2092 |
| Stockholm..... | 809·1 | 2093 |
| Antelope Creek, bed, 2,076; grade..... | 811·3 | 2098 |
| Tampico..... | 814·9 | 2105 |
| Summit, cutting 2 feet; grade..... | 817·9 | 2146 |
| Vandalia..... | 821·4 | 2120 |
| Hinsdale..... | 829·0 | 2162 |
| Beaver Creek, first crossing, bed, 2,145; water, 2,153; grade..... | 837·4 | 2170 |
| Beaverton..... | 838·3 | 2168 |
| Beaver Creek, second crossing, bed, 2,153; grade..... | 839·9 | 2172 |
| Same, third crossing, bed, 2,154; grade..... | 840·7 | 2173 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | Miles. | Feet. |
| Saco | 843·0 | 2175 |
| Beaver Creek, fourth crossing, bed, 2,159; high water, 2,175; grade | 843·5 | 2178 |
| Ashfield | 853·0 | 2205 |
| Beaver Creek, fifth crossing, bed, 2,185; low water, 2,188; grade | 853·4 | 2207 |
| Bowdoin | 861·2 | 2209 |
| Malta | 870·1 | 2242 |
| Milk River, second crossing, bed, 2,211; ordinary stage of water, 2,220; high water, 2,239; grade | 870·4 | 2245 |
| Exeter | 874·9 | 2254 |
| Wagner | 881·2 | 2258 |
| Dodson | 887·5 | 2279 |
| Eureka (a summit of grade) | 893·2 | 2301 |
| Savoy (also a summit of grade) | 900·5 | 2324 |
| Wayne | 906·0 | 2332 |
| Parallel Creek, bed, 2,326; grade | 913·0 | 2346 |
| Harlem | 914·6 | 2359 |
| Zurich | 922·9 | 2368 |
| Morris Creek, bed, 2,361; grade | 925·7 | 2375 |
| East Fork of Milk River, bed and water, about 2,361; grade | 929·6 | 2381 |
| North Fork Station | 930·0 | 2381 |
| West Fork of Milk River, grade | 934·9 | 2397 |
| Chinook (Fort Belknap) | 936·3 | 2401 |
| Milk River, third crossing, bed, 2,403; water, 2,406; grade .. | 941·7 | 2423 |
| Yantic | 943·8 | 2431 |
| Milk River, fourth crossing, bed, 2,421; grade | 947·0 | 2443 |
| Same, fifth crossing, bed, 2,421; grade | 947·4 | 2444 |
| Box Elder Creek, bed, 2,437; grade | 950·2 | 2454 |
| Toledo | 950·5 | 2455 |
| Havre | 957·5 | 2472 |
| Assiniboine | 964·9 | 2576 |
| Laredo | 972·2 | 2627 |
| Box Elder | 981·9 | 2669 |
| Box Elder Creek, bed, 2,647; grade | 982·7 | 2664 |
| Big Sandy Station | 992·6 | 2690 |
| Verona | 998·3 | 2708 |
| Coal Banks Coulee, bed, 2,754; grade | 1002·3 | 2793 |
| Cairo | 1005·1 | 2837 |
| Dry Fork siding | 1011·7 | 2984 |
| Dry Fork summit, cutting 4 feet; grade | 1012·4 | 3004 |
| (A slightly undulating profile, with no deep cutting, reaches across the watershed that divides the Milk and Missouri Rivers, to this summit, which lies within the Upper Missouri basin. Descending beyond Dry Fork summit, a gradient of 53 feet per mile reaches from 1,013·2 miles, grade, 2,979, to 1,017·8 miles, grade, 2,735.) | | |
| Marias River, bed, 2,545; grade | 1021·7 | 2564 |
| Missouri River at mouth of Marias River, low and high water, about | 1021·7 | 2545-2560 |
| Marias | 1022·3 | 2561 |
| Teton River, bed, 2,544; grade | 1023·0 | 2563 |
| Teton | 1027·4 | 2626 |
| In Government Coulee, very steep ascent, grade | 1029·1 | 2658-2834 |
| | to | |
| | 1030·6 | |
| Summit of ascending grade | 1030·8 | 2848 |
| Benton | 1033·7 | 2850 |
| Missouri River at Fort Benton, ordinary stage of water, about | 1033·7 | 2565 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

| | From St. Paul. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Tunis | 1040.9 | 2957 |
| Sidney | 1047.0 | 3098 |
| Flowerree | 1052.0 | 3203 |
| Huntley Coulee, bed, 3,163; grade | 1053.2 | 3227 |
| Summit, cutting 3 feet; grade | 1055.9 | 3364 |
| Reef Coulee, bed, 3,291; grade | 1057.2 | 3318 |
| Portage | 1059.3 | 3413 |
| Missouri River at mouth of Portage River (Highwood Creek), foot of series of falls and of portage 18 miles long | 1059.3 | 2783 |
| Summit, cutting 10 feet; grade | 1061.9 | 3502 |
| Portage Coulee, bed, 3,455; grade | 1062.1 | 3499 |
| Depression, crossing Black Horse Lake, surface, 3,398-3,401; grade | 1064.6 to 1065.9 | 3403 |
| Watson | 1068.5 | |
| Summit, grade (1 foot above natural surface) | 1069.1 | 3470 |
| Johnstown, junction of spur track to Great Falls | 1075.7 | 3480 |
| Sun River, bed, 3,291; ordinary stage of water, 3,299; high water, 3,306; grade | 1076.0 | 3311 |
| Missouri River at mouth of Sun River, ordinary low stage and high water | 1076.0 | 3320 |
| Connection with the Montana Central Railway, at south-west end of the bridge over Sun River, grade | 1076.05 | 3299-3306 |
| On the spur track to Great Falls: | | |
| Missouri River, at head of portage and succession of falls and rapids extending 18 miles, reported to amount in total to 512 feet, ordinary stage of water, 3,295; high water, 3,302; grade on bridge .. | 1076.2 to 1076.4 | 3312 |
| Great Falls | 1076.7 | |

PRINCETON BRANCH, ELK RIVER TO MILACA.

[This agrees exactly at Milaca Junction.]

| | | |
|--|------|------|
| Elk River Station | 38.5 | 692 |
| Junction with the main line (Elk River Junction) | 39.2 | 905 |
| Summit, cutting 10 feet; grade | 42.0 | 971 |
| Second summit, cutting 10 feet; grade | 49.5 | 992 |
| Princeton | 57.5 | 974 |
| West Branch of Rum River, bed, 952; water (mill-pond), 959; high water, 964; grade | 58.4 | 970 |
| Mouth of the West Branch of Rum River, water | 58.4 | 950 |
| Milaca Junction, line from Duluth to St. Cloud and Sioux Falls | 71.0 | 1070 |
| Milaca | 71.6 | 1072 |

SAUK CENTER AND NORTHERN BRANCH.

| | | |
|--|-------|------|
| Sauk Center | 116.8 | 1255 |
| Same, junction with the main line | 117.3 | 1257 |
| Hobogan Creek, water, 1,232; grade | 117.7 | 1248 |
| Ashley Creek, water, 1,241; grade | 120.4 | 1259 |
| Summit, cutting 8 feet; grade | 122.0 | 1300 |
| Creek, water, 1,261; grade | 122.8 | 1271 |
| Little Sauk | 126.8 | 1253 |
| Sauk River, water, 1,240; grade | 126.9 | 1253 |
| Summit, natural surface and grade | 129.6 | 1347 |
| Creek, water, 1,296; grade | 134.5 | 1301 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

SAUK CENTER AND NORTHERN BRANCH—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | Miles. | Feet. |
| Long Prairie..... | 135.4 | 1299 |
| Long Prairie River, water, 1,287; grade..... | 135.7 | 1294 |
| Dick's Creek, water, 1,269; grade..... | 142.8 | 1279 |
| Browerville..... | 143.0 | 1282 |
| Clarissa..... | 148.6 | 1332 |
| Eagle Creek, water, 1,329; grade..... | 150.1 | 1339 |
| Same, water, 1,346; grade..... | 152.3 | 1354 |
| Eagle Bend, about..... | 153.2 | 1380 |

EVANSVILLE AND TINTAH BRANCH.

[This agrees with the Minneapolis and Pacific Railway near Elbow Lake, and with the Breckenridge line at Tintah.]

| | | |
|---|-------|------|
| Evansville, junction with Fergus Falls line..... | 159.2 | 1353 |
| Summit, cutting 13 feet, grade..... | 159.9 | 1367 |
| Erdahl..... | 166.0 | 1266 |
| Pomme de Terre River, bed, 1,157; water, 1,160; grade.. | 170.7 | 1188 |
| Thorsborg..... | 171.3 | 1206 |
| Summit, cutting 2 feet; grade..... | 172.4 | 1239 |
| Crossing the Minneapolis and Pacific Railway..... | 174.3 | 1201 |
| Elbow Lake Station..... | 176.1 | 1197 |
| Depression, filling 15 feet; grade..... | 179.9 | 1113 |
| Summit, natural surface and grade..... | 180.8 | 1140 |
| Hereford..... | 183.8 | 1078 |
| Herman Beaches of Lake Agassiz, crests, respectively... } | 184.1 | 1078 |
| | and | and |
| | 184.4 | 1076 |
| Tintah, junction with the Breckenridge division and station, 193.0 miles from St. Paul by main line of that division..... | 192.3 | 997 |

PELICAN RAPIDS BRANCH.

[Proved to be correct by the agreement of two independent surveys.]

| | | |
|---|-------------|-----------|
| Fergus Falls, passenger depot..... | 187.2 | 1210 |
| Same, crossing the Northern Pacific, Fergus and Black Hills Railroad..... | 186.3 | 1194 |
| Pelican Junction, Northern Pacific, Fergus and Black Hills Railroad..... | 186.5 | 1189 |
| Red River, water, 1,178; grade..... | 186.7 | 1189 |
| Summit, cutting 4 feet; grade..... | 190.6 | 1254 |
| Depression, filling 4 feet; grade..... | 192.8 | 1211 |
| Elizabeth..... | 194.4 | 1240 |
| Pelican River, first crossing, bed, 1,222; grade..... | 195.3 | 1239 |
| Same, second crossing, bed, 1,227; grade..... | 196.1 | 1239 |
| Same, third crossing, bed, 1,233; grade..... | 196.4 | 1249 |
| Summit, level grade..... | 201.2-201.6 | 1295 |
| Erhart's..... | 201.9 | 1286 |
| Pelican River, fourth crossing, bed, 1,269; grade..... | 203.2 | 1277 |
| Summit, cutting 3 feet; grade..... | 204.9 | 1308 |
| Pelican River, fifth crossing, bed, 1,278; grade..... | 205.2 | 1295 |
| Same, sixth crossing, bed, 1,282; grade..... | 206.0 | 1289 |
| Summit, natural surface and grade..... | 207.3 | 1311 |
| Pelican Rapids..... | 207.9 | 1304 |
| Pelican River, water below and above the dam at Pelican Rapids..... } | 207.9 | 1291-1303 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FOSSTON BRANCH.

The profile here receives a subtraction of 5 feet at Carman, like the main line; and thence east to the crossing of the Duluth and Manitoba Railroad, a uniform subtraction of 7 feet. At this crossing, and also at Leech Lake, the elevation of which is determined by United States engineers, it requires a subtraction of 9 feet, which accordingly is made throughout that portion.

| | From Carman. | Above the sea. |
|--|--------------|----------------|
| | Miles. | Feet. |
| Carman, junction with main line near Crookston, 298·0 miles from St. Paul | 0·0 | 877 |
| Burwell | 6·1 | 914 |
| Benoit | 11·7 | 1019 |
| Beach of Lake Agassiz, 15 rods wide, crest, 1,062; grade .. | 14·2 | 1063 |
| Beach, crest (site of the Pembina trail), 1,069; grade | 14·3 | 1067 |
| [This beach ridge is 12 rods wide from its west base (1,062 feet) to its east base (1,065 feet).] | | |
| Beach 15 rods east of the last, crest, 1,069; grade | 14·35 | 1068 |
| Beach, crest, 1,092; grade | 15·6 | 1089 |
| (The descent from the crest is 11 feet in 12 rods to the west, and 4 feet in 10 rods to the east. From $\frac{1}{2}$ to $\frac{3}{4}$ of a mile west of this beach, natural surface and grade are 1,085–1,082, probably marking deposits formed contemporaneously in the margin of the lake. Intervening between this belt and the beach, a depression at 15·1 to 15·5 miles sinks to 1,079–1,081 feet.) | | |
| Beach, crest, 1,114; grade | 16·9 | 1110 |
| (This is a very massive beach ridge, having a descent of 18 feet westward from its crest in 50 rods, and of 8 feet eastward in 30 rods.) | | |
| Beach, crest, 1,120; grade, crossing the Duluth and Manitoba Railroad | 17·4 | 1116 |
| Beach, crest, 1,142; grade | 18·1 | 1138 |
| Dugdale | 18·2 | 1138 |
| Junction of branch graded toward Pelican Rapids | 18·5 | 1142 |
| On this branch: | | |
| Sand Hill River near center of Sec. 13, Garfield (T. 147, R. 44), low water, 1,116; grade | 29·7 | 1145 |
| Summit, natural surface and grade | 33·0 | 1195 |
| Creek tributary to Wild Rice River, crossed in Sec. 36, Strand (T. 145, R. 44), bed, 1,072; grade | 44·1 | 1107 |
| Wild Rice River in SW. $\frac{1}{4}$ of Sec. 25, Wild Rice (T. 144, R. 44), bed, 1,023; water, 1,025; grade | 49·8 | 1091 |
| End of located line, natural surface, 1,177; grade | 53·5 | 1174 |
| On the line from Dugdale eastward: | | |
| Crest of eastward ascent; grade | 19·3 | 1163 |
| (The surface is 1,161 to 1,167 feet thence to 23·4 miles. Small beaches are crossed at 22·4 and 22·5 miles, with their crests respectively at 1,166 and 1,167 feet.) | | |
| Mentor | 23·7 | 1167 |
| Hay Creek, one of the outlets of Maple Lake, bed, 1,156; grade | 23·9 | 1165 |
| Maple Lake, water | 23·9 | 1169 |
| Summit, natural surface, 1,169; grade | 25·1 | 1171 |
| Badger Lake, water, 1,172; grade | 29·5 | 1178 |
| Erskine | 30·3 | 1187 |
| (Morainic contour extends from 31·0 to 33·0 miles, and is succeeded by a moderately rolling surface farther east.) | | |
| Ravine between two lakes, bed, 1,199; grade | 31·9 | 1224 |
| McIntosh | 36·5 | 1218 |
| Poplar River, bed, 1,200; water, 1,204; grade | 37·4 | 1221 |
| (The next $\frac{1}{2}$ mile east has a morainic surface.) | | |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FOSTON BRANCH—Continued.

| | From Carman. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Foston | 44.0 | 1288 |
| End of track-laying November 20, 1888 | 44.7 | 1291 |
| On line surveyed for continuation of this branch east-southeast to the southwest arm of Leech Lake: | | |
| Summit near the east line of Sec. 35, T. 147, R. 39 | 53.5 | 1545 |
| Lakes $\frac{1}{4}$ mile east and southeast from the last, the most southern being called Long Lake | 54.2 | 1485 |
| Head stream of Clearwater River, bed (mud to depth of 10 feet) | 56.1 | 1439 |
| Creek tributary to Lower Rice Lake, bed, 1,466; bottom land, 1,469 | 61.8 | 1466 |
| Mississippi River (about 30 feet wide), bed, 1,371; water, 1,373; bottom land, 25 to 50 rods wide, 1,376; proposed grade of bridge | 77.1 | 1409 |
| (This crossing is distant about 11 miles in a straight line northward from Lake Itasca, being in Sec. 8, T. 145, R. 35.) | | |
| Creek, bed | 87.5 | 1381 |
| (Within $\frac{1}{4}$ mile both west and east the surface rises to 1,450-1,460 feet.) | | |
| Schoolcraft River, the "East Fork of the Mississippi," called La Place River by Nicollet's map, bed | 89.9 | 1372 |
| (Roughly morainic contour, with elevations 25 to 100 feet above the hollows, extends from 91.0 miles to Leech Lake, a distance of 30 miles.) | | |
| Summit, highest on this line of survey | 98.5 | 1576 |
| Leech Lake, water, raised by dam | 121.2 | 1297 |

ST. VINCENT LINE.

The profile requires, as noted on page 69, a uniform subtraction of 5 feet, which is here made, giving exact agreement with the Emerson Branch of the Canadian Pacific Railway on the international boundary.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Crookston | 299.3 | 863 |
| Junction with main line to Grand Forks and Great Falls | 300.5 | 885 |
| Shirley, junction of the St. Hilaire Branch | 305.8 | 900 |
| Euclid | 313.2 | 890 |
| Angus | 321.1 | 870 |
| Warren | 329.8 | 853 |
| Snake River, water, 838; grade | 330.2 | 855 |
| Argyle | 339.6 | 845 |
| Middle River, bed, 828; water, 831; grade | 340.2 | 842 |
| Tamarack River, bed, 811; water, 814; grade | 347.7 | 827 |
| Stephen | 348.1 | 827 |
| Donaldson | 356.6 | 826 |
| Kennedy | 361.4 | 825 |
| Hallock | 370.5 | 815 |
| South Branch of Two Rivers, bed, 791; water, 800; grade | 371.7 | 813 |
| Northcote | 376.1 | 802 |
| North Branch of Two Rivers, bed, 778; water, 784; grade | 376.5 | 798 |
| Humboldt | 382.9 | 792 |
| St. Vincent, switch of line to Emerson and Winnipeg | 389.2 | 787 |
| St. Vincent depot | 390.2 | 787 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

ST. VINCENT LINE—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Red River at St. Vincent, bed, 739; extreme low water, 748; usual water surface, 753; high water of 1866, 782; extreme high water (1882)..... | 390.2 | 788 |
| Grade on the international boundary..... | 391.2 | 790 |
| Red River here, high water of 1882..... | 391.2 | 786.5 |
| Emerson, on branch of Canadian Pacific Railway..... | 391.3 | 790 |

ST. HILAIRE BRANCH.

| | | |
|---|-------|------|
| Shirley, junction with the St. Vincent line..... | 305.8 | 900 |
| Ives, crossing of the old Pembina trail..... | 314.4 | 986 |
| (This is on the Lower McCauleyville Beach of Lake Agassiz, which is cut 4 or 5 feet across its width of about 20 rods; crest of the beach ridge, 990 feet.) | | |
| Upper McCauleyville Beach, crest, 997; grade..... | 314.7 | 993 |
| Little Black Creek, water, 975; grade..... | 315.4 | 987 |
| Black River, water, 970; grade..... | 318.0 | 997 |
| Campbell Beach, crest, 1,019, 6 feet above the land next east; grade..... | 318.5 | 1011 |
| Beginning of nearly level grade eastward, natural surface and grade the same..... | 323.2 | 1078 |
| (Thence a slightly undulating surface, with indistinct Lower Norcross Beaches, extends to St. Hilaire and the Red Lake River.) | | |
| St. Hilaire..... | 327.3 | 1086 |
| Red Lake River, about..... | 327.3 | 1065 |

ST. JOHN BRANCH.

| | | |
|--|-------|------|
| Church's Ferry, junction with main line to Great Falls.. | 427.9 | 1458 |
| (Thence north to Cando the surface is slightly undulating, with an average ascent of 2 feet per mile.) | | |
| Cando..... | 443.3 | 1488 |
| Coulée, bed, 1,470; grade..... | 444.0 | 1480 |
| Coulée, bed, 1,572; grade..... | 455.1 | 1585 |
| Bisbee..... | 456.0 | 1600 |
| Perth..... | 463.0 | 1731 |
| Big Coulée, bed, 1,754; grade..... | 469.8 | 1776 |
| Rolla..... | 475.3 | 1818 |
| St. John..... | 482.6 | 1945 |

BOTTINEAU BRANCH.

| | | |
|---|-------|------|
| Rugby Junction, main line to Great Falls..... | 465.9 | 1561 |
| Same, switch of this branch..... | 466.2 | 1558 |
| Creek, bed, 1,465; grade..... | 474.9 | 1472 |
| Barton..... | 478.7 | 1505 |
| Willow City..... | 487.0 | 1471 |
| Willow River, bed, 1,458; high water, 1,464; grade..... | 487.5 | 1469 |
| Oak Creek, bed, 1,617; grade..... | 503.7 | 1631 |
| Bottineau..... | 504.0 | 1638 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE, FROM ST. PAUL, BY WILLMAR, BRECKENRIDGE, MOORHEAD, AND GRAND FORKS, TO NECHE.

After the correction of the line from Crookston to Grand Forks and westward, as noted on page 69, this profile agrees with the numerous intersections of branches of this system and of other railways along its entire extent.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | Miles. | Feet. |
| St. Paul..... | 0·0 | 703 |
| Minneapolis..... | 10·3 | 810 |
| Clearwater Junction, branch to Clearwater and St. Cloud..... | 12·0 | 818 |
| Cedar Lake, water, 858; grade..... | 13·1 | 863 |
| Cedar Lake Station..... | 13·6 | 868 |
| Hutchinson Junction, branch to Hutchinson..... | 16·5 | 903 |
| Victoria Lake, water, 896; grade..... | 17·1 | 905 |
| St. Albans..... | 20·0 | 927 |
| Wayzata..... | 24·0 | 936 |
| Lake Minnetonka, water..... | 24·0 | 928 |
| Long Lake Station..... | 26·8 | 954 |
| Summit, grade..... | 31·9 | 1028 |
| Maple Plain..... | 32·1 | 1023 |
| Armstrong..... | 33·2 | 966 |
| Delano..... | 38·8 | 932 |
| South Fork of Crow River, water, 910; grade..... | 38·9 | 932 |
| Montrose..... | 45·5 | 994 |
| Waverly..... | 48·1 | 999 |
| Waverly Lake, water..... | 48·1 | 947 |
| Twelve Mile Creek, water, 961; grade..... | 50·3 | 1000 |
| Howard Lake Station..... | 53·4 | 1010 |
| Smith Lake Station..... | 56·1 | 1064 |
| Sucker Creek, water, 994; grade..... | 58·8 | 1017 |
| Cokato..... | 59·5 | 1050 |
| Cokato Lake, 2 miles northeast, water..... | 59·5 | 966 |
| Collinwood Creek, water, 1,020; grade..... | 62·8 | 1027 |
| Creek next west, flowing north, water, 1,027; grade..... | 63·9 | 1042 |
| Dassel..... | 65·3 | 1089 |
| Summit, grade..... | 66·4 | 1121 |
| Washington Creek, water, 1,066; grade..... | 67·6 | 1089 |
| Summit, grade..... | 68·4 | 1122 |
| Darwin..... | 70·6 | 1132 |
| Litchfield..... | 76·5 | 1129 |
| Outlet of Lake Ripley, water, 1,106; grade..... | 77·1 | 1116 |
| Outlet of Long Lake, water, 1,142; grade..... | 82·9 | 1154 |
| Grove City (formerly Swede Grove)..... | 84·3 | 1192 |
| Summit, Anderson's Hill, cutting 15 feet; grade..... | 87·6 | 1216 |
| Atwater..... | 89·4 | 1211 |
| Summit, cutting 3 feet; grade, highest point on this rail- way line..... | 94·3 | 1269 |
| Kandiyohi..... | 96·8 | 1222 |
| Willmar Junction, of line from Duluth to Sioux Falls..... | 101·3 | 1133 |
| Willmar..... | 102·5 | 1131 |
| Junction of the Willmar and Sioux Falls Railway..... | 103·0 | 1131 |
| Pennock (St. John's)..... | 109·1 | 1123 |
| Shakopee Creek, water, 1,086; grade..... | 115·4 | 1092 |
| Kerkhoven..... | 116·6 | 1110 |
| De Graff..... | 125·6 | 1063 |
| Cut, 16 feet deep; grade..... | 130·8 | 1068 |
| Benson..... | 132·9 | 1049 |
| Chippewa River, water, 1,022; grade..... | 133·8 | 1037 |
| Junction of the Watertown and Huron Branch..... | 133·9 | 1037 |
| Clontarf..... | 138·7 | 1046 |
| Hancock..... | 148·9 | 1157 |
| Summit, cutting only 1 foot; grade..... | 150·4 | 1174 |
| Pomme de Terre River, water, 1,068; grade..... | 153·9 | 1080 |
| Junction of the Brown's Valley Branch..... | 156·3 | 1122 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE, FROM ST. PAUL TO NECHE—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Morris | 157.4 | 1131 |
| Summit, grade | 159.4 | 1158 |
| Donnelly | 166.0 | 1126 |
| New Moose Island tank | 171.2 | 1095 |
| Moose Island Station, at old tank and section house | 171.7 | 1087 |
| Herman | 176.5 | 1072 |
| Edge of eroded low escarpment of till, natural surface, 1,076; grade | 177.8 | 1073 |
| Upper or Herman Beach of Lake Agassiz, crest, 1,068; grade | 178.1 | 1062 |
| Base of this beach ridge on its northwest side, natural surface, 1,051; grade | 178.3 | 1054 |
| Norcross, depot on crest of the Norcross Beach, crest and grade the same | 181.2 | 1041 |
| (This beach ridge is about 30 rods wide, with descent of 2 feet from its crest to the southeast and 8 feet to the northwest.) | | |
| Mustinka Creek, water, 1,020; grade | 182.9 | 1028 |
| Gorton | 183.8 | 1024 |
| Tintah, junction of branch from Evansville | 193.0 | 997 |
| Tintah Junction, Aberdeen Branch | 197.2 | 988 |
| Rabbit River, grade | 199.4 | 984 |
| Campbell | 200.1 | 984 |
| Doran | 207.3 | 973 |
| Breckenridge, junction with branch to Barnesville | 214.6 | 961 |
| Red River of the North, ordinary stage of low water, at the mouth of the Bois des Sioux River | 214.9 | 943 |
| Bois des Sioux River, bed, 944; grade | 214.9 | 962 |
| Wahpeton | 215.7 | 965 |
| Junction with line to Everest and Larimore | 216.7 | 963 |
| Crossing the Fargo and Southern (Chicago, Milwaukee and St. Paul) Railway | 220.2 | 960 |
| Lehigh | 222.0 | 957 |
| Red River, bed, 928; water, 931; grade | 222.7 | 955 |
| Kent | 229.0 | 942 |
| Whiskey Creek, bed, 915; grade | 229.3 | 942 |
| Wolverton | 238.0 | 929 |
| Holy Cross | 244.8 | 921 |
| Cooley, bed, 899; grade | 246.6 | 917 |
| Elmer | 250.0 | 912 |
| Finkle | 255.5 | 912 |
| Junction with line from Barnesville and crossing the Northern Pacific Railroad | 259.6 | 906 |
| Moosehead, 260.2 miles from St. Paul by this line, but only 241.3 miles by way of St. Cloud and Barnes- ville | 241.3 | 904 |
| Red River, bed, 861; ordinary low water, 870; high water in ordinary years, 880-890; extreme high water (1882), 898; grade | 241.7 | 903 |
| Fargo | 242.3 | 902 |
| Harwood | 250.7 | 886 |
| Sheyenne River, bed, 858; water, 862; grade | 252.2 | 886 |
| Argusville | 256.4 | 884 |
| Gardner | 262.6 | 886 |
| Grandin | 269.3 | 891 |
| Elm River, water, 865; grade | 270.0 | 893 |
| Kelso | 275.4 | 897 |
| North Branch of Elm River, water, 888; grade | 275.6 | 898 |
| Alton | 277.7 | 898 |
| Hillsboro | 281.1 | 901 |
| Goose River, water, 872; grade | 281.9 | 896 |
| Cummings | 288.9 | 928 |
| Buxton | 295.0 | 930 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE, FROM ST. PAUL TO NECHE—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| "Hubbard pit," an excavation for gravel ballast in a beach of Lake Agassiz, crest of beach, 928; grade..... (This beach ridge is about 30 rods wide; the descent from its crest is 5 or 6 feet to the south and 8 feet to the north.) | 298.3 | 922 |
| Reynolds | 299.8 | 910 |
| Thompson | 307.1 | 865 |
| Grand Forks Junction, on line to Great Falls, 3½ miles west of Grand Forks | 317.0 | 836 |
| University | 318.5 | 833 |
| Grand Forks, 324.5 miles from St. Paul by way of St. Cloud, Fergus Falls, and Crookston | 320.3 | 830 |
| English Cooley, bed, 795; high water, 809; grade..... | 323.1 | 825 |
| Schurmeier | 326.7 | 826 |
| Manvel | 333.2 | 819 |
| Turtle River, low water, 798; high water, 812; grade.... | 334.1 | 816 |
| Levant | 340.4 | 822 |
| Ardock | 345.0 | 824 |
| Forest River, low and high water, 799-808; grade..... | 350.9 | 816 |
| Minto | 351.3 | 820 |
| Grafton | 360.2 | 827 |
| Park River, low and high water, 809-819; grade..... | 360.6 | 827 |
| Auburn | 366.5 | 842 |
| Willow Creek, bed, 830; grade..... | 373.5 | 840 |
| St. Thomas | 374.1 | 840 |
| Glasston | 380.2 | 836 |
| Hamilton | 387.1 | 824 |
| Bathgate | 392.3 | 821 |
| Tongue River, bed, 801; low and high water, 803-816; grade..... | 392.5 | 821 |
| Neché | 400.1 | 831 |
| Pembina River, bed, 810; low and high water, 813-832; grade..... | 400.8 | 837 |
| Grade on the international boundary | 401.5 | 830 |
| Gretna, on branch of the Canadian Pacific Railway..... | 401.8 | 829 |

CLEARWATER BRANCH, FROM MINNEAPOLIS TO ST. CLOUD.

This agrees exactly with the Fergus Falls line at St. Cloud.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Minneapolis | 10.3 | 810 |
| Clearwater Junction, with the Breckenridge line | 12.0 | 818 |
| Parker | 17.2 | 880 |
| Shingle Creek, bed, 864; water, 867; grade | 21.8 | 878 |
| Osseo | 23.8 | 888 |
| Elm Creek, bed, 871; water, 874; grade..... | 26.4 | 881 |
| Rush Creek, bed, 898; water, 902; grade..... | 29.1 | 922 |
| Maple Grove | 29.8 | 943 |
| Hassan | 34.0 | 913 |
| Crow River, bed, 852; water, 855; grade | 35.4 | 872 |
| St. Michael's | 39.0 | 959 |
| Summit, cutting 15 feet; grade | 42.1 | 981 |
| Monticello | 47.4 | 933 |
| Silver Creek Station (a summit of grade)..... | 55.0 | 1013 |
| Silver Creek, bed, 961; water, 963; grade | 56.3 | 972 |
| Rice Lake Marsh, natural surface, 953; grade..... | 57.8 | 960 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

CLEARWATER BRANCH, FROM MINNEAPOLIS TO ST. CLOUD—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Rice Creek, bed, 950; water, 952; grade..... | 58·5 | 962 |
| Clearwater | 62·2 | 960 |
| Clearwater River, bed, 931; ordinary low water at its junction with the Mississippi, 936; high water (of Mississippi River), 954; grade | 62·5 | 960 |
| (This crossing is close below the lowest dam of the Clearwater River, and is only a few rods from its mouth.) | | |
| Plum Creek, bed, 950; water, 953; grade..... | 64·1 | 963 |
| Summit, natural surface and grade..... | 66·4 | 1006 |
| St. Augusta Creek, bed, 952; water, 955; grade | 68·2 | 983 |
| St. Augusta | 69·2 | 1014 |
| Three Mile Creek, bed, 988; water, 991; grade..... | 71·2 | 1012 |
| Summit, natural surface and grade..... | 73·7 | 1046 |
| Junction with the St. Cloud and Fergus Falls main line.. | 75·0 | 1040 |
| St. Cloud, 74·6 miles from St. Paul by way of Anoka and Elk River..... | 75·4 | 1037 |

HUTCHINSON BRANCH.

This agrees with connecting railways and other surveys at Excelsior and Hutchinson.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Hutchinson Junction, with the Breckenridge line..... | 16·5 | 903 |
| Minnehaha Creek, water, 896; grade..... | 18·1 | 912 |
| Summit, cutting 27 feet; grade..... | 21·5 | 970 |
| Depression, filling 10 feet; grade..... | 22·6 | 923 |
| Summit, cutting 10 feet; grade | 24·1 | 962 |
| Purgatory Creek, bed, 876; grade | 24·9 | 914 |
| Summit, grade | 26·9 | 992 |
| Road on bridge over railway, 1,011; grade | 27·1 | 983 |
| Crossing the Minneapolis and St. Louis Railway..... | 28·2 | 938 |
| Lake Minnetonka, low and high water..... | 28·2 | 925-929 |
| Excelsior | 28·7 | 944 |
| Same, grade near the Minneapolis and St. Louis depot, at same elevation with it..... | 29·2 | 947 |
| Centennial Lake, water, 945; grade..... | 34·0 | 952 |
| Six Mile Creek, bed, 926; grade..... | 38·5 | 945 |
| Clearwater Lake, water, 963; grade..... | 40·2 | 973 |
| Coney Island Station | 40·9 | 971 |
| Summit, cutting 19 feet; grade..... | 43·5 | 1000 |
| Mayer | 47·3 | 955 |
| South Fork of Crow River, bed, 930; low and high water, 932-937; grade..... | 47·4 | 955 |
| Crane Creek, water, 951; grade..... | 51·8 | 960 |
| Otter Creek, bed, 955; grade | 52·4 | 964 |
| Lester Prairie..... | 53·8 | 982 |
| Summit, cutting 7 feet; grade | 60·9 | 1057 |
| Silver Lake Station | 61·4 | 1052 |
| Outlet of Silver Lake, bed, 1,031; grade..... | 62·2 | 1042 |
| Bear Creek, bed, 1,026; grade | 62·8 | 1042 |
| Summit, cutting 10 feet; grade..... | 67·7 | 1070 |
| South Fork of Crow River, bed, 1,023; water, 1,026; grade..... | 68·9 | 1045 |
| Same, water below and above the dam, at Hutchinson, flowing Otter Lake, about..... | 69·5 | 1029-1038 |
| Hutchinson | 69·5 | 1040 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

WATERTOWN AND HURON BRANCH.

[The portion from Watertown to Huron is operated under a lease from the Duluth, Watertown and Pacific Railroad Company.]

In agreement with connecting railways at Watertown and Huron.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Junction with the Breckenridge line, 1 mile west of Benson | 133.9 | 1037 |
| Mud Creek, bed, 1,023; grade | 137.6 | 1029 |
| Dead Man's Slough, natural surface, 1,019–1,020; grade ... | 144.1–144.5 | 1023 |
| Pomme de Terre River, bed, 1,003; water, 1,005; grade ... | 153.1 | 1020 |
| Appleton | 154.8 | 1015 |
| Pomme de Terre River, bed, 980; water, 983; grade | 155.5 | 1005 |
| (This is near the intersection of the Hastings and Dakota Division of the Chicago, Milwaukee and St. Paul Railway.) | | |
| Minnesota River, bed, 933; low water, 935; bottom land, 935–938; grade | 159.8 | 944 |
| Louisburg | 163.8 | 1042 |
| Bellingham | 170.3 | 1049 |
| Boat Creek, tributary to the South Fork of the Yellow Bank River, bed, 1,087; grade | 177.5 | 1098 |
| Nassau | 179.2 | 1122 |
| Line between Minnesota and South Dakota, grade | 179.5 | 1122 |
| Albee (Walrath) | 184.7 | 1184 |
| La Bolt | 190.8 | 1362 |
| Summit, natural surface and grade | 208.0 | 1926 |
| Forrestville | 211.5 | 1868 |
| Rauville | 218.7 | 1757 |
| Crossing the Chicago and Northwestern Railway | 224.5 | 1726 |
| Watertown | 224.9 | 1726 |
| (This depot is 7 feet lower than that of the Chicago and Northwestern Railway.) | | |
| Big Sioux River, bed, 1,708; low and high water, 1,709–1,715; grade | 225.2 | 1718 |
| Depression at Pelican Lake, grade | 226.7–227.1 | 1716 |
| Thompson Creek, bed, 1,726; grade | 230.9 | 1750 |
| Grover | 234.7 | 1742 |
| Hazel | 241.1 | 1765 |
| Crossing the Chicago, Milwaukee and St. Paul Railway | 248.0 | 1829 |
| Vienna (a summit of grade) | 248.5 | 1837 |
| Willow Lakes Station | 256.9 | 1786 |
| Red Stone Creek, bed, 1,684; grade | 264.6 | 1695 |
| Same, bed, 1,669; grade | 264.8 | 1687 |
| Same, bed, 1,553; grade | 268.6 | 1569 |
| Bancroft | 269.0 | 1561 |
| Iroquois Creek, bed, 1,440; grade | 273.2 | 1456 |
| Osceola | 273.6 | 1453 |
| Pearl Creek, bed, 1,346; grade | 279.4 | 1355 |
| Yale | 281.2 | 1340 |
| Sheffield | 288.6 | 1300 |
| James River, bed, 1,221; low and high water, 1,227–1,246; grade | 291.0 | 1261 |
| Crossing the Dakota Central Division of the Chicago and Northwestern Railway | 293.9 | 1282 |
| Huron | 294.3 | 1287 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

BROWN'S VALLEY BRANCH.

This agrees with the Fargo and Southern Railway at Graceville, and with leveling for the U. S. Geological Survey of Lake Agassiz at Brown's Valley.

| | From St. Paul. | Above the sea. |
|--|-----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Junction with the Breckenridge line near Morris | 156.3 | 1122 |
| Summits, each cutting 4 feet; grade alike | 158.3 and 159.1 | 1140 |
| Mud Creek, water, 1,078; grade | 160.2 | 1105 |
| Wheeler | 163.5 | 1112 |
| Chokio | 169.6 | 1124 |
| Johnson | 175.6 | 1129 |
| Crossing the Fargo and Southern (Chicago, Milwaukee and St. Paul) Railway | 182.2 | 1112 |
| Graceville | 182.6 | 1109 |
| Barry | 188.4 | 1107 |
| Beardsley | 195.8 | 1098 |
| Top of the bluff east of Brown's Valley, grade | 199.4 | 1098 |
| Depression at foot of this bluff, surface | 202.3 | 975 |
| Brown's Valley | 202.7 | 960 |
| Minnesota River, low water | 202.7 | 972 |
| Lake Traverse, 1 mile north, low and high water, 970- 976; ordinary stages of water | 202.7 | 971-973 |

ABERDEEN BRANCH.

This agrees exactly or closely where it crosses the Fargo and Southern (Chicago, Milwaukee and St. Paul) and Minneapolis and Pacific Railways, and with connecting railways at Aberdeen.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Tintah Junction, Breckenridge line | 197.2 | 988 |
| South Branch of Rabbit River, bed, 969; high water, 982; grade | 197.9 | 988 |
| Campbell Beach of Lake Agassiz, rising 5 feet above the adjoining area westward, crest, 989; grade | 200.6 | 990 |
| Childs | 205.1 | 977 |
| Bois des Sioux River, bed, 961; bottom land, 967; grade | 206.6 | 972 |
| Crossing the Fargo and Southern (Chicago, Milwaukee and St. Paul) Railway | 208.6 | 985 |
| Campbell Beach, crest, 987; grade | 210.3 | 988 |
| De Villo | 210.4 | 987 |
| Sonora | 215.2 | 988 |
| (The profile shows in several places dunes 3 to 6 feet high, but no distinct beach, between Sonora and Hankinson.) | | |
| Hankinson | 222.7 | 1068 |
| Minor Beach of Lake Agassiz, crest, 1,089; grade | 224.7 | 1088 |
| Crossing the Minneapolis and Pacific Railway | 225.2 | 1088 |
| Stiles | 229.9 | 1139 |
| Summit, cutting 5 feet; grade | 231.4 | 1153 |
| Lidgerwood | 234.5 | 1122 |
| Geneseo | 240.8 | 1164 |
| Summit, grade | 242.1 | 1170 |
| Cayuga (a summit of grade) | 245.9 | 1148 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

ABERDEEN BRANCH—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | Miles. | Feet. |
| Wild Rice River, bed, 1,118; grade..... | 246.3 | 1132 |
| Rutland, junction of the Ellendale Branch | 252.1 | 1225 |
| Wild Rice River, bed, 1,202; grade | 254.3 | 1216 |
| Sprague Lake Station | 255.0 | 1219 |
| Havana (a summit of grade) | 261.3 | 1294 |
| Kidder..... | 268.0 | 1295 |
| Crossing the Chicago, Milwaukee and St. Paul Railway.. | 271.5 | 1309 |
| Burch..... | 275.1 | 1296 |
| (At this station and for a half mile westward the surface consists of dunes 5 to 10 feet in height, with their crests at 1,296 to 1,299 feet. Through the next 4 miles southwestward the surface is very flat, 1,293 to 1,294 feet. Thence numerous small dunes, with crests at 1,294 to 1,308 feet, are crossed in the distance of 2½ miles to Amherst. These are part of a north to south belt of dunes (also crossed by the Ellendale Branch) uplifted by the wind from the silty deposits of Lake Dakota, which, as shown by Prof. J. E. Todd, occupied the James River Valley along an extent of about 170 miles from Mitchell to Oakes during the recession of the ice-sheet.) | | |
| Amherst (a summit of grade)..... | 281.9 | 1312 |
| Claremont | 288.5 | 1302 |
| Huffman | 293.9 | 1307 |
| Putney | 299.3 | 1306 |
| James River water-tank, grade..... | 302.5 | 1284 |
| James River, bed, 1,269; water, 1,272; grade..... | 303.3 | 1286 |
| Plans | 307.0 | 1302 |
| Moccasin Creek, bed, 1,284; water, 1,286; grade..... | 314.1 | 1297 |
| Crossing the Chicago, Milwaukee and St. Paul and Chicago and Northwestern Railways..... | 315.6 | 1300 |
| Aberdeen | 316.0 | 1300 |

ELLENDALE BRANCH.

Agreeing with the Chicago, Milwaukee and St. Paul Railway at Ellendale.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | Miles. | Feet. |
| Rutland, junction with the Aberdeen Branch | 252.1 | 1225 |
| Depression, grade..... | 253.1 | 1217 |
| Belle Plaine | 258.9 | 1270 |
| Summit, cutting 2 feet; grade..... | 261.6 | 1319 |
| Brookland | 263.9 | 1304 |
| Crossing the Chicago, Milwaukee and St. Paul Railway.. | 265.1 | 1299 |
| Lake bed, natural surface, 1,286-1,287; grade | 268.8-269.4 | 1290 |
| Straubville | 270.9 | 1314 |
| Summit, cutting 6 feet; grade (crossing a morainic belt).. | 274.1 | 1346 |
| Dunes, natural surface, 1,314-1,324; grade..... | 275.1-275.6 | 1319 |
| Crescent Hill Station..... | 277.0 | 1313 |
| (Small dunes, crests, 1,315-1,312 feet, are crossed at 277.6 to 278.6 miles.) | | |
| Riverdale..... | 281.0 | 1304 |
| Crossing the Chicago and Northwestern Railway..... | 281.8 | 1303 |
| James River, bed, 1,283; low water, level with the dam at Columbia, 1,286; high water (1882), 1,292; grade.. | 282.7 | 1296 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

ELLENDALE BRANCH—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Gnelph (a summit of grade)..... | 287·0 | 1369 |
| Depression, bed of culvert, 1,342; grade..... | 287·5 | 1354 |
| Summit, cutting 8 feet; grade..... | 291·9 | 1415 |
| Silver Leaf..... | 293·9 | 1405 |
| Maple River, bed, 1,370; high water, 1,382; grade..... | 295·5 | 1396 |
| Ellendale..... | 301·0 | 1453 |
| Same, junction with the Chicago, Milwaukee and St. Paul Railway..... | 301·3 | 1453 |

BRECKENRIDGE TO MOORHEAD BY WAY OF BARNESVILLE.

Agreeing with other portions of this railway system and with other railways at Barnesville and Moorhead.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Breckenridge..... | 214·6 | 961 |
| Red River, water, 951; grade..... | 215·6 | 965 |
| Manston..... | 231·1 | 978 |
| Mushroom Creek (head of South Branch of Buffalo River), water, 974; grade..... | 234·1 | 981 |
| Deer Horn Creek, water, 972; grade..... | 237·8 | 982 |
| Atherton..... | 237·9 | 981 |
| Junction with the main line by St. Cloud and Crookston to Great Falls, 0·4 mile north of Barnesville..... | 243·1 | 1009 |
| Willow River (more commonly called Whiskey Creek), bed, 994; grade (at junction, 243·1 miles of this line from Breckenridge)..... | 218·3 | 1009 |
| Barnesville depot, 217·9 miles from St. Paul by way of the St. Cloud and Fergus Falls Division, but 243·5 miles by way of Breckenridge..... | 217·9 | 1020 |
| Junction with main line to Crookston and Great Falls... Baker..... | 218·9 | 1000 |
| South Branch of Buffalo River, bed, 908; grade..... | 225·1 | 944 |
| Sabin..... | 231·4 | 922 |
| Crossing the Northern Pacific Railroad..... | 232·4 | 930 |
| Moorhead..... | 240·7 | 906 |
| | 241·3 | 904 |

MOORHEAD NORTHERN BRANCH.

| Junction with line from Barnesville a half mile east of Moorhead..... | 240·8 | 906 |
|---|-------|-----|
| Kragues..... | 249·0 | 892 |
| Buffalo River, low water, 853; high water (1881), 873; extreme high water (of Red River), about 882; grade.. | 255·2 | 884 |
| Georgetown..... | 255·6 | 884 |
| Perley..... | 262·3 | 877 |
| Hendrum..... | 268·3 | 875 |
| Wild Rice River, low water, 836; high water (1881), 858; grade..... | 270·0 | 872 |
| Halstad..... | 274·4 | 870 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FROM WAHPETON BY CASSELTON, MAYVILLE, LARIMORE, AND PARK RIVER, TO LANGDON.

The profile agrees with connecting railways and other branches of this system at Davenport, Everest, Casselton, Portland Junction, and Larimore. Leveling for the survey of the beaches of Lake Agassiz, from Park River and Walhalla northward, is also found to agree with the Canadian Pacific Railway at Thornhill.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | Miles. | Feet. |
| Wahpeton..... | 215.7 | 965 |
| Junction with main line by Breckenridge and Moorhead to Neche..... | 216.7 | 963 |
| Wild Rice River, water, 936; grade..... | 219.9 | 953 |
| Antelope Creek, water, 931; grade..... | 222.2 | 954 |
| Dwight..... | 222.7 | 954 |
| Barrett..... | 231.4 | 953 |
| Colfax..... | 235.7 | 960 |
| Walcott..... | 241.8 | 960 |
| Sheyenne River, water, 930; grade..... | 248.3 | 948 |
| Kindred..... | 249.7 | 942 |
| Davenport, crossing the Fargo and Southwestern (Northern Pacific) Railroad..... | 254.8 | 923 |
| Addison..... | 258.5 | 917 |
| Maple River, water, 904; grade..... | 262.1 | 920 |
| Durbin..... | 262.6 | 918 |
| Dry Run, bed, 910; grade..... | 263.6 | 920 |
| Everest, junction of line to Ripon and Portland..... | 267.6 | 935 |
| Casselton, crossing the Northern Pacific Railroad..... | 270.6 | 938 |
| Amenia..... | 277.8 | 954 |
| Rush River, bed, 945; grade..... | 279.5 | 957 |
| (An ice gorge below this bridge April 4, 1882, raised the water above the track at Amenia.) | | |
| Arthur..... | 284.7 | 992 |
| South Fork of Elm River, bed, 962; grade..... | 290.4 | 980 |
| Hunter..... | 290.7 | 980 |
| Greenfield..... | 296.5 | 948 |
| North Fork of Elm River, bed, 927; grade..... | 301.1 | 947 |
| Blanchard..... | 301.4 | 947 |
| Murray..... | 307.7 | 960 |
| Goose River, bed, 924; water, held by dam, 936; grade.. | 312.5 | 954 |
| Mayville..... | 313.5 | 978 |
| Portland Junction, line from Ripon and Portland..... | 318.3 | 1009 |
| Hatton..... | 325.0 | 1065 |
| Northwood..... | 333.3 | 1119 |
| Kempton..... | 339.7 | 1127 |
| Junction with line from Grand Forks to Great Falls..... | 345.5 | 1130 |
| Larimore..... | 345.9 | 1134 |
| Park River Junction, with line to Great Falls..... | 348.3 | 1133 |
| South Branch of Turtle River, bed, 1,109; grade..... | 349.9 | 1127 |
| McCanna..... | 354.0 | 1140 |
| North Branch of Turtle River, bed, 1,115; grade..... | 356.7 | 1132 |
| Summit, natural surface and grade..... | 358.3 | 1164 |
| Orr's..... | 360.5 | 1098 |
| Inkster..... | 364.8 | 1036 |
| McCauleyville Beach of Lake Agassiz, crest, 996; grade.. | 366.3 | 991 |
| (This beach ridge is about 30 rods wide; the descent from its crest is 5 feet to the south and 8 feet to the north.) | | |
| Forest River, bed, 941; grade..... | 366.6 | 980 |
| Conway..... | 370.9 | 988 |
| McCauleyville Beach, crest, 996; grade..... | 374.3 | 998 |
| (Along the greater part of its course for the next 8 miles to Park River, the railway is built on this beach ridge.) | | |
| Park River Station..... | 382.3 | 998 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FROM WAHPETON TO LANGDON—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| South Branch of Park River, bed, 964; grade..... | 382.9 | 996 |
| Small stream, bed, 1,087; grade..... | 386.5 | 1107 |
| Beach of Lake Agassiz, crest, 1,128; grade..... | 387.2 | 1129 |
| (This beach ridge has a width of 25 rods, with a descent of 4 or 5 feet from its crest to its base on each side.) | | |
| Beach, crest, 1,155; grade..... | 388.3 | 1156 |
| (From the crest there is a descent of 16 feet in a quarter of a mile southeastward along the railway, and of 2 feet in 15 rods northwestward.) | | |
| Beach, crest, 1,163; grade..... | 388.45 | 1161 |
| (The descent to the east is 10 feet in 25 rods, and to the west 3 feet in 15 rods.) | | |
| Edinburgh..... | 391.7 | 1189 |
| Small stream, bed, 1,182; grade..... | 392.3 | 1191 |
| Middle Branch of Park River, bed, 1,242; water, 1,243; grade..... | 395.1 | 1278 |
| Water course tributary to the Middle Branch, bed, 1,298; grade..... | 396.9 | 1352 |
| Second water course tributary to the Middle Branch, bed, 1,327; grade..... | 398.2 | 1409 |
| Another water course tributary to the Middle Branch, bed, 1,479; grade..... | 400.6 | 1507 |
| Top of steep westwardly ascending grade (1 foot above the natural surface)..... | 402.6 | 1579 |
| Milton..... | 404.2 | 1586 |
| Water course tributary to the North Branch of Park River, bed, 1,586; grade..... | 406.5 | 1594 |
| Osnabrock..... | 410.0 | 1620 |
| Summit, natural surface and grade..... | 414.7 | 1659 |
| Langdon..... | 421.6 | 1610 |
| Pembina River at the bridge a half mile east of Wall-halla (determined by survey from Park River), low and high water, 934-943; proposed grade of railway bridge, 953 feet.) | | |

FROM EVEREST AND RIPON TO PORTLAND.

This agrees with the Northern Pacific Railroad, and with the line through Cassel-ton and Mayville at Portland Junction.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Everest, junction with the Mayville line..... | 267.6 | 935 |
| Crossing the Northern Pacific Railroad..... | 271.8 | 954 |
| Campbell Beach of Lake Agassiz, crest, 994; grade..... | 274.3 | 989 |
| Ripon..... | 278.0 | 1040 |
| Junction of the Hope Branch..... | 278.2 | 1046 |
| Swan Creek, bed, 1,049; grade..... | 280.5 | 1070 |
| Creek, bed, 1,067; grade..... | 284.3 | 1091 |
| Tank and section house, grade..... | 286.3 | 1094 |
| Rush River, bed, 1,074; grade..... | 286.5 | 1098 |
| Erie..... | 288.3 | 1126 |
| Summit, grade..... | 289.5 | 1131 |
| South Branch of North Fork of Elm River, bed, 1,062; grade..... | 295.8 | 1081 |
| Depression, grade..... | 296.3 | 1079 |
| Summit, grade..... | 296.9 | 1089 |
| Line of Cass and Traill Counties, grade..... | 297.1 | 1087 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FROM EVEREST AND RIPON TO PORTLAND—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Galesburg..... | 299·1 | 1079 |
| North Branch of North Fork of Elm River, bed, 1,063; grade..... | 299·7 | 1076 |
| Clifford..... | 304·2 | 1055 |
| Roseville..... | 310·4 | 1009 |
| Portland..... | 314·7 | 983 |
| Goose River, bed, 933; water, 936; grade..... | 315·6 | 975 |
| Portland Junction, 318·3 miles from St. Paul by way of Mayville..... | 319·1 | 1009 |

HOPE BRANCH.

| | | |
|--|-------|------|
| Junction near Ripon..... | 278·2 | 1046 |
| Tank, grade..... | 278·8 | 1065 |
| Absaraka..... | 279·3 | 1080 |
| Upper or Herman Beach of Lake Agassiz, crest, 1,097; grade..... | 279·8 | 1096 |
| Swan Creek, bed, 1,078; grade..... | 280·9 | 1111 |
| Ayr (formerly Elgin)..... | 285·1 | 1200 |
| Summit, cutting 3 feet; grade..... | 288·6 | 1236 |
| Page City..... | 294·2 | 1175 |
| Colgate..... | 301·2 | 1177 |
| Hope..... | 307·6 | 1241 |

MAIN LINE FROM DULUTH, BY HINCKLEY, ST. CLOUD, AND WILLMAR, TO SIOUX FALLS.

[The portion from Duluth to Hinckley is operated under a lease from the Eastern Railway Company of Minnesota; and the portion beyond Willmar under a lease from the Willmar and Sioux Falls Railway Company.]

The profile from Duluth to Hinckley is in two series of leveling, which meet half way between these points. Referring the northeastern part to sea level by the known height of Lake Superior, the elevations thence derived for the southwestern part of the profile are 8 feet lower than those of the St. Paul and Duluth Railroad at Hinckley. The latter, however, seems to be reliable, and the southwest half of this profile (at Willow River and thence to Hinckley) is therefore made to agree with the St. Paul and Duluth Railroad. The discrepancy of 8 feet is all placed thus at the point of connection of the two separate series of leveling, their difference being taken as 437 feet instead of the 429 feet stated by the profile.

From Hinckley to St. Cloud the original figures of the profile (obtained by leveling independent of the foregoing) receive here a uniform addition of 13 feet, to agree with the St. Cloud and Fergus Falls division of this railway system and the St. Paul and Northern Pacific Railroad at St. Cloud and East St. Cloud, and with the Princeton Branch at Milaca Junction; but only an addition of 11 feet is made to this profile at Hinckley for accord with the St. Paul and Duluth Railroad.

The profile from St. Cloud to Willmar agrees with the Minneapolis and Pacific Railway at Paynesville, and with the Breckenridge division at Willmar; and the profile of the Willmar and Sioux Falls Railway agrees with intersecting railways at Granite Falls, Hanley Falls, Marshall, Pipestone, and Sioux Falls.

| | From Duluth. | Above the sea. |
|---------------------------------------|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Duluth..... | 0·0 | 607 |
| Lake Superior, mean..... | 1·0-2·0 | 602 |
| West Superior..... | 2·6 | 631 |
| Boylston..... | 10·3 | 687 |
| Nemadji River, water, 620; grade..... | 12·6 | 711 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE FROM DULUTH TO SIOUX FALLS—Continued.

| | From Duluth. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Dedham | 17.2 | 802 |
| West Balsam Creek, bed, 824; grade | 20.6 | 872 |
| Boundary between Wisconsin and Minnesota, grade | 23.0 | 929 |
| Foxboro | 24.2 | 956 |
| East Fork of Net River, bed, 924; grade | 26.7 | 1002 |
| Net River, bed, 968; grade | 28.6 | 1042 |
| (The Norway Hills, consisting of morainic and kame-like drift, are crossed from 29.1 to 33.3 miles, having along the line of this survey crests 10 to 40 feet above the depressions, while the height of the crests above the sea level rises in this distance from 1,065 to 1,160 feet.) | | |
| Holyoke | 33.4 | 1141 |
| Willow River, bed, 1,142; grade | 38.8 | 1153 |
| Kerrick | 39.2 | 1155 |
| Mansfield | 47.2 | 1156 |
| Summit, cutting 15 feet; grade | 51.1 | 1220 |
| Partridge | 55.6 | 1166 |
| Kettle River (near Sandstone, between the Upper and Lower Falls), ordinary stage of water, 955; grade | 61.0 | 988 |
| Wareham | 63.7 | 1082 |
| Summit, cutting 12 feet; grade | 65.3 | 1098 |
| Grindstone River, water, 1,007; grade | 70.2 | 1032 |
| Hinckley | 70.4 | 1032 |
| Same, crossing the St. Paul and Duluth Railroad | 70.8 | 1032 |
| Little Pokegama Creek, water, 1,011; grade | 75.3 | 1024 |
| Pokegama | 77.8 | 1028 |
| Pokegama Creek, water, 1,011; grade | 78.5 | 1023 |
| Mud Creek, water, 1,001; grade | 83.4 | 1013 |
| Snake River, water, 945; grade | 91.2 | 979 |
| Ann River, water, 958; grade | 92.8 | 999 |
| North Branch of Ground House River, water, 1,021; grade | 97.1 | 1037 |
| Ground House | 97.5 | 1040 |
| South Branch of Ground House River, water, 1,018; grade | 101.8 | 1046 |
| Bogus Brook, water, 1,041; grade | 104.2 | 1074 |
| Milaca | 109.7 | 1072 |
| Rum River (East Branch), bed, 1,036; water, 1,042; grade | 110.2 | 1066 |
| Milaca, junction of the Princeton Branch | 110.3 | 1070 |
| West Branch of Rum River, water, 1,056; grade | 112.4 | 1076 |
| Bridgeman | 113.0 | 1092 |
| Estes Brook Station | 115.9 | 1109 |
| Estes Brook, water, 1,090; grade | 116.3 | 1100 |
| Oak Park | 119.0 | 1130 |
| St. Francis River, water, 1,103; grade | 120.6 | 1110 |
| Creek, water, 1,106; grade | 121.2 | 1111 |
| St. Francis | 121.4 | 1115 |
| Rice Creek, water, 1,118; grade | 123.6 | 1130 |
| Foley | 123.8 | 1132 |
| Parent | 128.0 | 1120 |
| Elk River, water, 1,014; grade | 130.2 | 1043 |
| Former water course, extending from the Mississippi River at Sauk Rapids southeasterly to the Elk River, natural surface | 136.2-136.8 | 1021-1024 |
| Crossing the St. Paul and Northern Pacific Railroad | 137.2 | 1025 |
| Mississippi River, water held by dam, 975; grade | 137.7 | 1032 |
| St. Cloud, 74.6 miles from St. Paul | 138.1 | 1037 |
| St. Cloud, junction of line to Fergus Falls | 140.0 | 1048 |
| O'Brien | 142.0 | 1078 |
| Rockville | 149.3 | 1075 |
| Sauk River, bed, 1,070; water, 1,075; water above the dam, 1,082; grade | 153.6 | 1091 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE FROM DULUTH TO SIOUX FALLS—Continued.

| | From Duluth. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Cold Springs..... | 153.9 | 1095 |
| Creek, bed, 1,084; grade..... | 156.9 | 1110 |
| Richmond..... | 158.2 | 1122 |
| Sank River, bed, 1,078; ordinary low water, 1,083; grade..... | 158.8 | 1116 |
| Summit, natural surface and grade..... | 159.6 | 1133 |
| Depression, natural surface, swampy, 1,087-1,089; grade..... | 160.9-161.5 | 1091 |
| Roscoe..... | 164.7 | 1161 |
| Paynesville..... | 169.9 | 1180 |
| Crossing the Minneapolis and Pacific Railway..... | 170.8 | 1184 |
| North Fork of Crow River, bed, 1,165; water, 1,166; bottom land, 1,172; grade..... | 171.5 | 1182 |
| Hawick..... | 175.4 | 1238 |
| Summit, cutting 2 feet; grade..... | 176.0 | 1248 |
| Outlet of Long Lake, bed, 1,205; grade..... | 178.6 | 1230 |
| Summit, cutting 6 feet; grade..... | 179.2 | 1244 |
| New London..... | 181.9 | 1215 |
| Middle Fork of Crow River, mill-pond, level with Nest Lake, water, 1,162; grade..... | 184.1 | 1190 |
| Green Lake, water..... | 184.1 | 1154 |
| Spicer..... | 186.3 | 1167 |
| Water course tributary to Green Lake, bed, 1,157; grade..... | 186.6 | 1167 |
| Water course tributary to Eagle Lake, bed, 1,133; grade..... | 190.2 | 1161 |
| Summit, cutting 10 feet; grade..... | 192.5 | 1189 |
| Willmar Junction, Breckenridge line..... | 195.1 | 1133 |
| Willmar, 102.5 miles from St. Paul..... | 196.3 | 1131 |
| Junction, leaving the Breckenridge line..... | 196.8 | 1131 |
| Raymond..... | 208.3 | 1084 |
| Clara City..... | 215.9 | 1056 |
| Maynard..... | 221.8 | 1030 |
| Minnesota River, water, 910; grade..... | 230.0 | 927 |
| Granite Falls..... | 230.8 | 930 |
| Crossing the Minneapolis and St. Louis Railway..... | 240.5 | 1048 |
| Hanley Falls..... | 240.6 | 1049 |
| Cottonwood..... | 246.7 | 1077 |
| Three Mile Creek, bed, 1,080; grade..... | 253.1 | 1094 |
| Green Valley..... | 254.0 | 1105 |
| Crossing the Winona and St. Peter division of the Chicago and Northwestern Railway..... | 259.1 | 1169 |
| Marshall..... | 259.2 | 1169 |
| Lynd..... | 265.9 | 1330 |
| (Very uneven morainic contour, with elevations 20 to 80 feet above the depressions, is crossed by this railway from Lynd to Russell.) | | |
| Russell..... | 272.2 | 1518 |
| Dakota Central division of the Chicago and Northwestern Railway, its grade..... | 277.2 | 1639 |
| This railway goes over the preceding; grade on bridge..... | 277.2 | 1661 |
| Florence..... | 280.1 | 1725 |
| Ruthven..... | 285.2 | 1733 |
| Summit, cutting 2 feet; grade (highest in crossing the Coteau des Prairies)..... | 288.7 | 1826 |
| Holland (a summit of grade)..... | 293.0 | 1780 |
| Crossing the Burlington, Cedar Rapids and Northern, and Chicago, St. Paul, Minneapolis and Omaha Railways..... | 301.6 | 1725 |
| Crossing the Chicago, Milwaukee and St. Paul Railway..... | 301.7 | 1726 |
| Pipestone..... | 301.8 | 1729 |
| Ihlen..... | 308.5 | 1648 |
| Split Rock Creek, low and high water, 1,623-1,627; grade..... | 309.0 | 1650 |
| Same, water, 1,536; grade..... | 313.0 | 1548 |

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE FROM DULUTH TO SIOUX FALLS—Continued.

| | From Duluth. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Jasper (on the line between Pipestone and Rock Counties) | 313·2 | 1545 |
| Split Rock Creek, water, 1,504; grade | 316·7 | 1520 |
| Same, water, 1,495; grade | 318·1 | 1513 |
| Line between Minnesota and South Dakota, grade | 319·4 | 1510 |
| Sherman | 320·8 | 1496 |
| Split Rock Creek, low and high water, 1,476–1,484; grade .. | 321·3 | 1495 |
| Devil's Gulch, water, 1,455; grade | 323·7 | 1501 |
| Split Rock Creek, low and high water, 1,430–1,445; grade .. | 325·3 | 1465 |
| Palisades | 326·1 | 1457 |
| Split Rock Creek, water, 1,313; grade | 331·5 | 1346 |
| Corson | 332·4 | 1362 |
| Big Sioux River, low and high water in ordinary years, 1,290–1,298; extreme high water, about 1,307; grade .. | 336·0 | 1311 |
| Crossing the Chicago, St. Paul, Minneapolis and Omaha Railway | 338·6 | 1323 |
| Crossing the Illinois Central Railroad | 342·0 | 1389 |
| Crossing the Chicago, Milwaukee and St. Paul Railway .. | 342·6 | 1404 |
| Big Sioux River, above the upper dam of Sioux Falls, low and high water, 1,383–1,388; grade | 342·7 | 1407 |
| Crossing the Burlington, Cedar Rapids and Northern Railway | 342·8 | 1410 |
| Sioux Falls | 343·2 | 1420 |
| End of track-laying October 26, 1888 | 343·5 | 1425 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM.

[From profiles in the office of George H. White and M. D. Rhame, engineers, Minneapolis; and in part from manuscript and profiles furnished by George B. Woodworth, assistant engineer, Milwaukee.]

ST. PAUL TO MINNEAPOLIS, SHORT LINE.

Referred to sea level by the elevation of the Mississippi River at St. Paul, determined by United States engineers; and agreeing at Minneapolis with the St. Paul and Northern Pacific, and the St. Paul, Minneapolis and Manitoba Railways.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. Paul, extreme low and high water of the Mississippi River | 0·0 | 683·702 |
| St. Paul, union depot | 0·0 | 703 |
| Chestnut Street Station | 0·8 | 709 |
| Summit, cutting 12 feet; grade | 4·8 | 937 |
| Merriam Park | 5·8 | 908 |
| Mississippi River, bed, 702; ice (1879), 709; high water, 724; top of rock in east river bluff, 799; crest of river bluff, 828; grade | 7·3 | 843 |
| Short Line Junction | 9·0 | 842 |
| Minneapolis, depot of this railway, Washington avenue S., opposite Fourth avenue | 10·8 | 826 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

ST. PAUL TO MINNEAPOLIS, BY FORT SNELLING.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. Paul..... | 0·0 | 703 |
| Mendota, junction with the Chicago, St. Paul, Minneapolis and Omaha Railway | 5·6 | 722 |
| Bridge crossing the Chicago, St. Paul, Minneapolis and Omaha Railway | 6·0 | 738 |
| St. Paul Junction, Mendota, with line to Austin and McGregor | 6·4 | 760 |
| Minnesota River, bed, 672; low water, 688; high water, 710; grade | 7·0 | 718 |
| Fort Snelling Station | 7·2 | 722 |
| (The fort is about 75 feet higher on the crest of the river bluff.) | | |
| Minnehaha | 9·6 | 813 |
| Minnehaha Creek, bed, 802; water, 803; grade | 9·7 | 816 |
| Minnehaha Falls, 50 feet | 9·7 | 800-750 |
| Short Line Junction | 13·0 | 842 |
| Minneapolis | 14·8 | 826 |

HASTINGS TO BENTON JUNCTION.

Referred to sea level at Hastings by the elevation of the Mississippi River, determined by United States engineers; and agreeing with connecting railways at Farmington, Shakopee, Chaska, and Benton Junction.

| | From Hastings. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Hastings, extreme low water of the Mississippi River, 670·5; high water (1880), 687·3; extreme high water (1881), about 690 | 0·0 | 670·5-690 |
| Hastings, junction with the River division | 0·0 | 707 |
| Top of ascending grade, at edge of prairie in Sec. 5, Marshall, natural surface and grade the same | 3·0 | 825 |
| Vermilion, about | 8·1 | 825 |
| Auburn | 11·9 | 860 |
| Farmington, crossing the Iowa and Minnesota division .. | 17·5 | 902 |
| Lakeville (Fairfield) | 22·3 | 941 |
| Summit, close west of the line between Dakota and Scott Counties, Minn., cutting 10 feet; grade | 26·5 | 1081 |
| Summit, cutting 12 feet; grade | 32·8 | 959 |
| Prior Lake Station | 33·1 | 947 |
| Prior Lake, bed, 882; water | 33·7 | 907 |
| Cut, 27 feet deep; grade | 34·2 | 937 |
| Cut, 25 feet deep; grade | 36·1 | 901 |
| Shakopee, crossing the Chicago, St. Paul, Minneapolis and Omaha Railway | 41·5 | 753 |
| Minnesota River, bed, 668; low water, 690; high water, 717; grade | 44·5 | 725 |
| Chaska | 45·4 | 726 |
| Crossing the Minneapolis and St. Louis Railway | 45·5 | 728 |
| Carver | 47·5 | 813 |
| Bridge over road and ravine, bed of ravine, 747; grade .. | 47·8 | 816 |
| Dahlgren | 50·9 | 920 |
| Summit, cutting 6 feet; grade | 51·4 | 981 |
| Carver Creek, bed, 906; grade | 52·3 | 928 |
| Benton Junction, of line from Minneapolis to Aberdeen .. | 53·7 | 942 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

HASTINGS AND DAKOTA DIVISION, MAIN LINE.

[Minneapolis to Ortonville and Aberdeen, with continuation of this line to Bowdle.]

This agrees with connecting railways at Benton Junction, Norwood, Appleton, Ortonville, Groton, and Aberdeen.

| | From Minne- apolis. | Above the sea. |
|---|------------------------|----------------|
| | Miles. | Fect. |
| Minneapolis..... | 0·0 | 826 |
| Short Line Junction..... | 1·8 | 842 |
| Summit, grade..... | 4·8 | 880 |
| Neck of land between the Lake of the Isles and Lake Calhoun, natural surface, 856; grade..... | 5·4 | 859 |
| West Minneapolis Transfer, at Bass Lake, grade..... | 6·9 | 884 |
| Bass Lake, water..... | 6·9 | 878 |
| Summit, cutting 17 feet; grade..... | 8·2 | 913 |
| Depression, filling 10 feet; grade..... | 8·5 | 899 |
| Hopkins Station, cutting 12 feet; grade..... | 8·9 | 911 |
| Minnehaha Creek, bed, 893; grade..... | 9·1 | 910 |
| Shady Oak Lake, bed, 869; water, 905; grade..... | 12·2 | 909 |
| Crossing the Minneapolis and St. Louis Railway..... | 13·2 | 921 |
| Island Lake, water, 892; grade..... | 14·5 | 897 |
| Purgatory Creek, bed, 838; grade..... | 15·3 | 900 |
| Duck Lake, water, 910; grade..... | 15·8 | 920 |
| Chanhassen..... | 18·4 | 965 |
| Lake Hazeltine, water, 917; grade..... | 21·7 | 922 |
| Hazeltine..... | 21·9 | 928 |
| Chaska Creek, bed, 893; water, 895; grade..... | 22·6 | 936 |
| Augusta..... | 27·1 | 978 |
| Lake Ave, bed, 912; water, 942; grade..... | 28·6 | 945 |
| Carver Creek, bed, 909; water, 911; grade..... | 29·9 | 921 |
| Benton Junction, of line from Hastings..... | 30·7 | 942 |
| Cologne..... | 32·6 | 945 |
| Summit, cutting 9 feet; grade..... | 37·0 | 989 |
| Crossing the Pacific division of the Minneapolis and St. Louis Railway..... | 39·4 | 972 |
| Norwood..... | 39·9 | 988 |
| Tiger Lake, water..... | 41·4 | 977 |
| Summit, $\frac{1}{2}$ mile east of the line between Carver and Mo- Leod Counties, cutting 6 feet; grade..... | 43·4 | 1002 |
| Buffalo Creek; bed, 964; grade..... | 46·4 | 981 |
| Summit, cutting 5 feet; grade..... | 50·7 | 1019 |
| Glencoe..... | 51·2 | 1006 |
| Peat marsh, grade..... | 53·0 | 1027 |
| Summit, cutting 3 feet; grade..... | 53·5 | 1033 |
| Sumter..... | 57·0 | 1035 |
| Depression, grade..... | 59·0 | 1012 |
| Summit, grade..... | 60·3 | 1036 |
| Gravel pits, grade..... | 61·0 | 1020 |
| Buffalo Creek, water, 1,005; grade..... | 61·2 | 1019 |
| Brownston..... | 61·4 | 1024 |
| Summit, cutting 10 feet; grade..... | 61·6 | 1026 |
| Lake Addie, water, 1,007; grade..... | 61·9 | 1019 |
| Summit, grade..... | 64·1 | 1057 |
| Depression, grade..... | 64·4 | 1049 |
| Summit, cutting 3 feet; grade..... | 67·8 | 1074 |
| Stewart..... | 68·1 | 1064 |
| Depression, grade..... | 69·1 | 1057 |
| Summit, grade..... | 70·1 | 1076 |
| Near McLaughlin's Lake, grade..... | 71·6 | 1064 |
| Creek, bed, 1,060; grade..... | 73·2 | 1066 |
| Summit, highest between Hastings and Ortonville; grade..... | 77·4 | 1093 |
| South Fork of Buffalo Creek, bed, 1,067; grade..... | 78·5 | 1082 |
| Hector..... | 79·5 | 1081 |
| Summit, grade..... | 80·8 | 1091 |
| Bird Island..... | 88·5 | 1089 |
| Olivia..... | 93·1 | 1082 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

HASTINGS AND DAKOTA DIVISION—Continued.

| | From Minne- apolis. | Above the sea. |
|---|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| East Fork of Beaver Creek, bed, 1,066; grade..... | 93.6 | 1073 |
| West Fork of Beaver Creek, bed, 1,051; grade..... | 100.8 | 1057 |
| Renville..... | 104.3 | 1064 |
| Sacred Heart..... | 111.2 | 1061 |
| Hawk Creek, water, 963; top of bluff west of creek, 1,041; grade..... | 116.4 | 1017 |
| East line of Chippewa County, grade..... | 117.8 | 1047 |
| Minnesota Falls..... | 118.4 | 1041 |
| Granite Falls..... | 120.4 | 941 |
| Palmer's Creek, grade..... | 122.8 | 921 |
| Myer's Station and Brofee's Creek, grade..... | 128.4 | 932 |
| Rock cut, 10 feet deep; grade..... | 131.8 | 948 |
| Montevideo..... | 133.8 | 927 |
| Chippewa River, water, 913; grade..... | 134.0 | 930 |
| Top of bluff, grade..... | 136.6 | 1009 |
| Watson..... | 140.1 | 1029 |
| Beginning of descent westward..... | 141.3 | 1028 |
| Depression, level grade..... | 144.1-144.6 | 937 |
| Top of ascending grade..... | 146.3 | 993 |
| Milan..... | 149.1 | 995 |
| Two miles farther northwest, grade..... | 151.1 | 1019 |
| Summit, grade..... | 154.5 | 1035 |
| Appleton Station, and crossing the Watertown and Huron Branch of the St. Paul, Minneapolis and Mani- toba Railway..... | 157.3 | 1007 |
| Pomme de Terre River, water, 978; grade..... (This railway is straight from 158.6 miles to Odessa, a distance of 14 miles.) | 157.6 | 1007 |
| East line of Big Stone County, grade..... | 161.4 | 987 |
| Correll..... | 164.1 | 980 |
| Summit, level grade..... | 165.4-166.5 | 985 |
| Odessa..... | 172.6 | 963 |
| Stony Run, water, 958; grade..... | 173.3 | 965 |
| Summit, grade..... | 177.2 | 1002 |
| Junction of the Fargo and Southern Railway, and of spur to Ortonville..... | 177.9 | 997 |
| Ortonville (on spur, 1.2 miles from main line)..... | 179.1 | 990 |
| Minnesota River, bed, 962; grade..... | 178.6 | 972 |
| Big Stone Lake, low and high water, 962-967; ordinary stage of water..... | 179.5 | 963 |
| Big Stone City..... | 179.5 | 979 |
| Whetstone River beside this railway, water, 973; grade..... | 180.0 | 1003 |
| Cut, 48 feet deep; grade..... | 180.1 | 1005 |
| Whetstone River, bed, 998; water, 1,005; grade..... | 180.8 | 1025 |
| Milbank, junction of the Whetstone Branch..... | 189.9 | 1148 |
| Foot of the Coteau des Prairies, near Twin Brooks Station..... | 198.0 | 1294 |
| Marvin..... | 205.0 | 1657 |
| West line of Grant County, grade..... | 210.7 | 1939 |
| Summit Station, on the crest of the Coteau des Prairies, cutting 3 feet, highest grade on this line..... | 212.3 | 2000 |
| Depression, filling 7 feet; grade..... | 214.9 | 1939 |
| Summit, natural surface and grade..... | 217.5 | 1961 |
| Waubay..... | 225.7 | 1813 |
| Depression, filling 9 feet; grade..... | 228.7 | 1803 |
| Summit, cutting 7 feet; grade..... | 233.6 | 1849 |
| Depression, filling 11 feet; grade..... | 235.5 | 1819 |
| Webster..... | 236.2 | 1842 |
| Summit, cutting 6 feet; grade..... | 236.6 | 1848 |
| Bristol, junction of line to Madison..... | 247.6 | 1775 |
| Andover, junction of the Harlem Branch..... | 257.6 | 1476 |
| Foot of descending grade, filling 3 feet..... | 261.7 | 1349 |
| Groton, near junction with branch of the Chicago and Northwestern Railway..... | 267.3 | 1304 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

HASTINGS AND DAKOTA DIVISION—Continued.

| | From Minne- apolis. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| James River, bed, 1,267; water, 1,269; top of river bank, 1,277; grade..... | 275.0 | 1282 |
| Bath | 278.4 | 1301 |
| Moccasin Creek, bed, 1,284; grade | 285.1 | 1295 |
| Crossing the Chicago and Northwestern Railway | 285.8 | 1300 |
| Aberdeen, junction with the James River division | 286.4 | 1300 |
| Mina | 299.5 | 1432 |
| Ipswich | 312.7 | 1530 |
| Roscoe, junction of branches to Orient and Eureka..... | 328.0 | 1826 |
| Summit, grade | 340.9 | 2017 |
| Bowdle..... | 343.2 | 1995 |

ORTONVILLE TO FARGO (FARGO AND SOUTHERN RAILWAY).

This agrees with connecting railways at Graceville, Sewall, Wahpeton, and Fargo.

| | From Minne- apolis. | Above the sea. |
|---|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Junction with the Hastings and Dakota division, main line, near Ortonville..... | 177.9 | 997 |
| Top of continuous ascent from the junction; grade..... | 180.9 | 1110 |
| Rupert | 187.2 | 1136 |
| Batavia..... | 190.1 | 1163 |
| Summit, natural surface and grade | 191.5 | 1187 |
| Tokua Lake, water, 1,091; grade | 197.1 | 1103 |
| Graceville | 197.9 | 1111 |
| Crossing the Brown's Valley Branch of the St. Paul, Minneapolis and Manitoba Railway | 198.3 | 1112 |
| Ravine, bed, 1,044; grade | 204.4 | 1052 |
| Dumont | 203.2 | 1048 |
| Wheaton | 215.3 | 1018 |
| Mustinka River, bed, 977; grade..... | 215.9 | 993 |
| Summit, cutting 10 feet in gravel and sand, a delta of Lake Agassiz, grade..... | 220.7 | 1036 |
| Bois des Sioux River, bed, 966; ordinary low water, 968; grade..... | 224.2 | 975 |
| White Rock | 224.4 | 973 |
| Sewall (Fairmount)..... | 234.2 | 983 |
| Crossing the Minneapolis and Pacific Railway | 234.5 | 985 |
| Crossing the St. Paul, Minneapolis and Manitoba Rail- way | 235.0 | 985 |
| Tyler | 240.6 | 969 |
| Wahpeton, crossing the Northern Pacific, Fergus and Black Hills Railroad | 248.4 | 965 |
| Same, crossing the St. Paul, Minneapolis and Manitoba Railway | 248.6 | 965 |
| Wahpeton depot | 248.8 | 964 |
| Woodhull..... | 256.0 | 952 |
| Abercrombie..... | 262.9 | 935 |
| Christine | 272.6 | 928 |
| Hickson | 279.2 | 917 |
| Wild Rice Station..... | 284.6 | 911 |
| Wild Rice River, bed, 881; grade | 285.1 | 911 |
| Saunders | 288.4 | 907 |
| Rose Creek, bed, 882; grade | 289.3 | 906 |
| Big Slough, bottom, 897-894; grade (level to crossing of the Northern Pacific Railroad)..... | 293.0-294.2 | 905 |
| Fargo..... | 294.9 | 903 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

WHETSTONE BRANCH.

| | From Minneap- olis. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Milbank, junction with the Hastings and Dakota di- vision, main line | 189·9 | 1148 |
| South Branch of Whetstone River, bed, 1,130; grade | 190·7 | 1147 |
| Middle Branch of Whetstone River, bed, 1,131; grade | 194·1 | 1145 |
| Corona | 200·0 | 1173 |
| North Branch of Whetstone River, bed, 1,166; grade | 204·6 | 1181 |
| Wilmot (a summit of grade, cutting 3 feet) | 206·8 | 1196 |
| Depression, filling 8 feet; grade | 208·2 | 1168 |
| Summit, cutting 7 feet; grade | 212·7 | 1201 |
| Depression (South Branch of the Minnesota River), fill- ing 6 feet; grade | 215·1 | 1179 |
| Summit, natural surface and grade | 222·7 | 1221 |
| (This summit is 60 rods south from the end of the track.) | | |

RIVER DIVISION, AND PART OF THE DUBUQUE DIVISION, MAIN LINE, ST. PAUL
TO LA CROSSE AND NORTH MCGREGOR.

This agrees with connecting railways and other divisions and branches of this system, and with the elevations of the Mississippi River, determined by United States engineers, at Hastings, Cannon Junction, Wabasha, Winona, La Crosse, and North McGregor.

| | From Minneap- olis. | Above the sea. |
|---|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Minneapolis, depot of this railway, Washington avenue S., opposite Fourth avenue | 0·0 | 826 |
| St. Paul, union depot | 10·8 | 703 |
| Dayton's Bluff Station | 12·2 | 707 |
| Newport | 18·9 | 749 |
| Langdon | 24·3 | 811 |
| St. Croix Junction, Stillwater Branch | 29·7 | 694 |
| Mississippi River, bed, 657; extreme low water, 669; or- dinary stage, 673; extreme high water, 690; grade | 30·2 | 704 |
| Hastings (a summit of grade), junction of the Hastings and Dakota division | 30·5 | 707 |
| Vermilion River, water, 675; grade | 31·7 | 693 |
| Etter | 39·0 | 689 |
| Eggleston | 43·6 | 689 |
| Cannon Junction, Cannon Falls line | 47·5 | 692 |
| Cannon River, water, 677; grade | 47·8 | 691 |
| Red Wing | 51·5 | 685 |
| (Zero of Red Wing city levels, at low water of the Mississippi River in 1859, 668 feet above mean sea level.) | | |
| Wacouta | 57·4 | 706 |
| Frontenac | 62·1 | 718 |
| Lake City | 68·4 | 703 |
| Minnie (or Collins) Creek, water, 670; grade | 69·9 | 697 |
| Conway Creek, water, 671; grade | 70·9 | 691 |
| (Lake Pepin, extending from Wacouta to Read's Landing, extreme low water, 664; extreme high water, 680·5.) | | |
| Read's Landing | 79·0 | 681 |
| Mississippi River here, extreme low and high water | 79·0 | 663·7-680·5 |
| Read's Junction, Chippewa Valley and Superior division | 79·8 | 686 |
| Wabasha (a summit of grade) | 81·1 | 711 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

RIVER DIVISION, ETC.—Continued.

| | From Minne- apolis. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Fest.</i> |
| Midland Junction, crossing the line to Zumbrota (Wabasha division) | 86.2 | 694 |
| Zumbro River, water, 682; grade | 86.8 | 693 |
| Kellogg | 87.2 | 701 |
| Weaver | 94.7 | 672 |
| Minneiska | 97.7 | 670 |
| Mount Vernon | 99.4 | 673 |
| Whitman | 103.2 | 678 |
| Minnesota City | 108.0 | 675 |
| Mississippi River here, extreme low and high water | 108.0 | 643-662.4 |
| St. Peter Junction, crossing the Chicago and Northwestern Railway | 112.8 | 674 |
| Winona | 114.1 | 660 |
| Homer | 118.5 | 661 |
| Lamoille | 123.1 | 658 |
| Richmond | 127.5 | 672 |
| Dakota | 131.8 | 655 |
| Dresbach | 132.8 | 674 |
| River Junction, with the Southern Minnesota division .. | 137.5 | 643 |
| On line to La Crosse: | | |
| Junction with the Southern Minnesota division, near the west end of the bridge | 138.9 | 655 |
| La Crosse Bridge, extreme low and high water of the Mississippi River | 139.3 | 628-643.5 |
| On line from River Junction southward: | | |
| La Crescent | 138.6 | 649 |
| Southern Minnesota Junction, Dubuque and Southern Minnesota divisions | 140.9 | 643 |
| Brownsville | 148.4 | 641 |
| Caledonia Junction, Preston Branch | 155.3 | 639 |
| New Albin | 162.8 | 648 |
| Lansing | 174.2 | 632 |
| Heytman's | 181.7 | 634 |
| Harper's Ferry | 189.5 | 646 |
| Waukon Junction, Waukon Branch | 193.3 | 631 |
| North McGregor, junction with the Iowa and Dakota Division | 201.0 | 625 |
| Mississippi River here, low and high water | 201.0 | 604-626 |

STILLWATER BRANCH.

Agreeing with connecting railways at Stillwater.

| | From Hastings. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Fest.</i> |
| St. Croix Junction, River division, 29.7 miles from Minneapolis | 0.8 | 694 |
| Point Douglas | 3.0 | 709 |
| Straight Cooley, grade | 8.8 | 700 |
| Trout Brook, grade | 11.3 | 699 |
| Afton | 14.6 | 695 |
| Lakeland | 17.6 | 742 |
| Baytown (South Stillwater) | 22.4 | 694 |
| Stillwater | 25.7 | 694 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

CANNON FALLS LINE, RED WING TO NORTHFIELD.

This agrees at Cannon Junction, Randolph, and Northfield.

| | From Red Wing. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Red Wing..... | 0.0 | 685 |
| Cannon Junction, River division..... | 4.0 | 692 |
| Crossing slough, bottom, 675; grade..... | 4.2 | 684 |
| Deep cut, grade..... | 9.7 | 730 |
| Welch..... | 11.5 | 719 |
| Cannon River, bed, 732; grade..... | 15.4 | 752 |
| Same, bed, 736; grade..... | 15.6 | 755 |
| Summit, grade..... | 18.3 | 821 |
| Creek, bed, 771; grade..... | 18.6 | 817 |
| Pine Creek, bed, 766; grade..... | 19.4 | 780 |
| Cannon Falls..... | 21.4 | 816 |
| Paxton's Glen, grade..... | 22.5 | 841 |
| Crossing the Chicago, St. Paul and Kansas City Railway, Randolph..... | 27.0 | 876 |
| Chub Creek, bed, 859; water, 864; grade..... | 27.4 | 877 |
| Waterford..... | 33.9 | 902 |
| Crossing the Wisconsin, Minnesota and Pacific (Minneapolis and St. Louis) Railway..... | 35.4 | 912 |
| Northfield, junction with the main line of the Iowa and Minnesota division..... | 36.0 | 916 |

WABASHA DIVISION, WABASHA TO ZUMBROTA.

This agrees with the Chicago and Northwestern Railway at Zumbrota.

| | From Wabasha. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Wabasha..... | 0.0 | 711 |
| East Wabasha..... | 1.0 | 680 |
| Midland Junction, crossing the River division..... | 6.1 | 694 |
| Glasgow..... | 12.8 | 715 |
| McCracken..... | 17.7 | 731 |
| Theilman..... | 20.3 | 742 |
| Lakey..... | 23.3 | 755 |
| Keegan..... | 25.2 | 758 |
| Millville..... | 29.1 | 786 |
| Jarrett..... | 31.7 | 791 |
| Hammond..... | 34.3 | 804 |
| Funk..... | 37.7 | 819 |
| Zumbro Falls..... | 41.8 | 835 |
| Summit, grade..... | 47.8 | 894 |
| Depression, grade..... | 49.0 | 867 |
| Bright's..... | 49.2 | 871 |
| Mazeppa..... | 52.2 | 934 |
| Forest Mills..... | 58.4 | 969 |
| Summit, grade..... | 59.8 | 985 |
| Zumbrota..... | 60.0 | 979 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

CHIPPEWA VALLEY AND SUPERIOR DIVISION, WABASHA TO EAU CLAIRE.

Referred to sea level at Wabasha by connection with the River division; and agreeing there with the elevation of the Mississippi River determined by United States engineers, and at Eau Claire with the Chicago, St. Paul, Minneapolis and Omaha Railway.

| | From Wabasha. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Wabasha | 0·0 | 711 |
| Read's Junction, River division | 1·3 | 686 |
| Mississippi River at mouth of the Chippewa River, low water (1864), 663; high water (1880), 682; grade..... | 1·6 | 686 |
| Trevino..... | 3·3 | 680 |
| Plumer's Mill | 5·6 | 684 |
| Maxwell | 11·4 | 698 |
| Chippewa River here, high water (1880)..... | 11·4 | 696 |
| Beef Slough, high water (1880), 703; grade..... | 14·1 | 712 |
| Round Hill Station..... | 15·8 | 736 |
| Durand..... | 18·5 | 724 |
| Red Cedar..... | 24·7 | 759 |
| Red Cedar Junction, Menomonie Branch..... | 25·7 | 729 |
| Tyrone | 27·4 | 729 |
| Meridian..... | 32·4 | 746 |
| Caryville | 36·9 | 758 |
| Porter's Mills | 43·2 | 769 |
| Chippewa River, grade..... | 46·3 | 785 |
| Shawtown..... | 46·5 | 777 |
| Chippewa River, high water, 780; grade..... | 47·8 | 790 |
| Eau Claire..... | 48·0 | 788 |
| Crossing the Chicago, St. Paul, Minneapolis and Omaha Railway..... | 48·8 | 828 |
| Central Transfer, junction with the Wisconsin Central Railroad..... | 49·8 | 900 |

MENOMONIE BRANCH.

| | | |
|--|------|-----|
| Red Cedar Junction, with the foregoing..... | 25·7 | 729 |
| Chippewa River near the mouth of Red Cedar River, high water (1880), 728; grade..... | 26·1 | 736 |
| Dunnville | 27·7 | 731 |
| Downsville | 32·4 | 754 |
| Red Cedar River, high water, 758; grade..... | 32·9 | 765 |
| Menomonie | 41·2 | 805 |
| Cedar Falls..... | 46·2 | 867 |

PRESTON BRANCH.

| | From Caledonia Junction. | Above the sea. |
|--|--------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Caledonia Junction, Dubuque Division, main line, 155·3 miles from Minneapolis..... | 0·0 | 639 |
| Freeburg..... | 6·0 | 659 |
| Foot of westward ascent..... | 12·0 | 971 |
| Caledonia | 14·0 | 1179 |
| Spring Grove | 23·8 | 1324 |
| New House | 29·0 | 1194 |
| Mabel | 32·8 | 1117 |
| Donald Switch..... | 37·0 | 1354 |
| Canton | 41·2 | 1330 |
| Harmony (a summit of grade)..... | 46·6 | 1339 |
| Root River, water, 905; grade | 57·0 | 928 |
| Preston..... | 58·0 | 822 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

IOWA AND MINNESOTA DIVISION, MAIN LINE, MINNEAPOLIS AND ST. PAUL TO AUSTIN AND CALMAR.

This agrees with connecting railways and other divisions and branches of this system at St. Paul Junction, Farmington, Northfield, Faribault, Owatonna, Ramsey, Austin, Taopi, Conover, and Calmar.

| | From Minne- apolis. | Above the sea. |
|---|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Minneapolis | 0-0 | 826 |
| St. Paul Junction, Mendota, 6.4 miles from St. Paul | 8.4 | 760 |
| Summit, cutting 5 feet; grade | 15-0 | 900 |
| Westcott | 16-0 | 883 |
| At a lake 2 miles south; grade | 18-0 | 915 |
| Summit, grade | 20-0 | 974 |
| At Keegan's Lake, grade | 20-5 | 949 |
| Rosemount | 22-1 | 960 |
| Vermilion River, water, 890; grade | 28-9 | 898 |
| Farmington, crossing the Hastings and Dakota division .. | 29-1 | 902 |
| Farmington depot | 29-3 | 905 |
| Summit, cutting 11 feet; grade | 32-6 | 1003 |
| Castle Rock | 36-1 | 936 |
| (The height of "Castle Rock" above the adjoining surface is 44 feet; of its slender portion above the broader pedestal, 19 feet.) | | |
| Chub Creek, water, 918; grade | 37-8 | 924 |
| Summit, cutting 12 feet; grade | 40-8 | 970 |
| Northfield, junction with the Cannon Falls line | 42-2 | 916 |
| Heath Creek, water, 906; grade | 43-3 | 922 |
| Dundas | 45-3 | 956 |
| Wolf Creek, water, 948; grade | 46-4 | 975 |
| Summit, cutting 9 feet; grade | 50-0 | 1038 |
| Depression, grade | 50-8 | 972 |
| Summit, cutting 30 feet; grade | 53-6 | 1018 |
| Cannon River, water, 960; grade | 55-0 | 976 |
| Crossing the Wisconsin, Minnesota and Pacific (Minne- apolis and St. Louis) Railway | 55-2 | 983 |
| Faribault | 55-8 | 1003 |
| Summit, cutting 4 feet; grade | 58-5 | 1085 |
| Summit, cutting 14 feet; grade | 61-2 | 1141 |
| Straight River, low and high water, 1,070-1,086; grade .. | 64-8 | 1091 |
| Medford | 65-1 | 1102 |
| Clinton Falls | 66-9 | 1112 |
| Maple Creek, water, 1,118; grade | 70-3 | 1133 |
| Owatonna depot and crossing the Winona and St. Peter division of the Chicago and Northwestern Railway .. | 71-0 | 1146 |
| Summit, grade | 74-7 | 1246 |
| Pratt | 76-2 | 1223 |
| Aurora | 79-7 | 1255 |
| Turtle Creek, water, 1,240; grade | 80-2 | 1248 |
| Bixby | 82-9 | 1306 |
| Summit, grade | 86-5 | 1318 |
| Blooming Prairie | 88-9 | 1291 |
| Madison | 94-5 | 1255 |
| Lansing | 98-1 | 1229 |
| Ramsey, crossing the Southern Minnesota division | 100-6 | 1221 |
| Red Cedar River, bed, 1,186; water, 1,191; grade | 101-0 | 1206 |
| Wolf Creek, bed, 1,182; grade | 102-2 | 1209 |
| Austin | 103-6 | 1203 |
| Dobbin's Creek, bed, 1,177; water, 1,181; grade | 103-9 | 1200 |
| Austin Junction, Austin and Mason City line | 104-1 | 1200 |
| Rose Creek, bed, 1,228; grade | 111-4 | 1242 |
| Rose Creek Station | 111-8 | 1251 |
| Summit, cutting 7 feet; grade | 115-2 | 1307 |
| Little Cedar River, water, 1,258; grade | 116-0 | 1278 |
| Creek, bed, 1,265; grade | 117-9 | 1280 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

IOWA AND MINNESOTA DIVISION—Continued.

| | From Minne- apolis. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Adams..... | 118.2 | 1282 |
| Summit, cutting 2 feet; grade..... | 121.1 | 1349 |
| Taopi, near crossing of the Chicago, St. Paul and Kan- sas City Railway..... | 121.9 | 1342 |
| Creek, bed, 1,276; grade..... | 127.1 | 1291 |
| Creek, bed, 1,274; grade..... | 127.6 | 1291 |
| Summit, cutting 5 feet; grade..... | 128.4 | 1306 |
| Le Roy..... | 129.9 | 1286 |
| State line, natural surface and grade..... | 130.4 | 1269 |
| Staff Creek, water, 1,231; grade..... | 134.1 | 1242 |
| Chester..... | 137.4 | 1232 |
| Beaver Creek, water, 1,193; grade..... | 141.0 | 1208 |
| Cut 19 feet deep; grade..... | 142.2 | 1245 |
| Lime Springs..... | 142.4 | 1246 |
| Summit, cutting 7 feet; grade..... | 144.6 | 1298 |
| Head of Turkey River, bed, 1,263; grade..... | 147.0 | 1270 |
| Bonair (a summit of grade)..... | 147.5 | 1309 |
| Depression, grade..... | 151.0 | 1269 |
| Cresco..... | 153.5 | 1300 |
| Depression, level grade..... | 154.7-155.7 | 1283 |
| Summit, natural surface and grade..... | 156.5 | 1300 |
| Depression, filling 21 feet; grade..... | 164.9 | 1190 |
| Conover, junction of the Decorah Branch..... | 169.5 | 1235 |
| Summit, natural surface and grade..... | 171.6 | 1288 |
| Calmar, junction with the Iowa and Dakota division, 42 miles from North McGregor..... | 172.5 | 1257 |

AUSTIN TO MASON CITY.

This agrees with connecting railways at Lyle, Plymouth Junction, and Mason City.

| | From Minne- apolis. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Austin Junction, with main line of the Iowa and Minne- sota division..... | 104.1 | 1200 |
| Rose Creek, water, 1,171; grade..... | 107.5 | 1191 |
| Summit, grade..... | 109.0 | 1218 |
| Depression, grade..... | 113.7 | 1191 |
| Lyle..... | 115.0 | 1206 |
| Same, junction with Minnesota Branch of the Illinois Central Railroad, and crossing the Chicago, St. Paul and Kansas City Railway..... | 115.2 | 1200 |
| At the State line, grade..... | 115.4 | 1192 |
| Red Cedar River, water, 1,124; grade..... | 118.2 | 1147 |
| Otranto..... | 118.8 | 1170 |
| Carpenter..... | 122.2 | 1190 |
| Grafton..... | 128.7 | 1228 |
| Plymouth..... | 135.2 | 1125 |
| Plymouth Junction, Burlington, Cedar Rapids and North- ern Railway..... | 136.1 | 1126 |
| Junction with the Central Iowa Railway..... | 143.1 | 1125 |
| Junction with the Iowa and Dakota division..... | 143.2 | 1127 |
| Mason City, 116 miles from North McGregor..... | 143.4 | 1128 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

DECORAH BRANCH.

This agrees with the Burlington, Cedar Rapids and Northern Railway at Decorah.

| | From Minne- apolis. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Conover, junction with the main line of the Iowa and Minnesota division | 169.5 | 1235 |
| Creek, top of bank, 1,058; water | 172.3 | 1032 |
| Creek, top of bank, 994; water | 175.0 | 984 |
| Creek, top of bank, 897; water | 178.0 | 885 |
| Decorah | 178.5 | 875 |

SOUTHERN MINNESOTA DIVISION, MAIN LINE, LA CROSSE TO WOONSOCKET.

This division and the Mankato Branch are from manuscripts and profiles furnished by George B. Woodworth, assistant engineer, Milwaukee.

Notes of this division, which were received in 1881, extending from La Crosse to 5 miles west of the James River, and including the Mankato Branch and the line to Sioux Falls, give elevations above low water of the Mississippi River at La Crosse, where they are referred to sea level by the determination of that elevation by United States engineers. Comparing these notes with the connecting railways, which latter are known to be correct by their mutual agreements, they are found to match exactly at Ramsey, Albert Lea, Winnebago City, and the Blue Earth River, and on the Mankato Branch; but in proceeding thence westward additions are required and are here made as follows: At Prairie Junction, 7 feet; and at Sioux Falls Junction and forward across the James River, 10 feet, making a discrepancy of 3 feet with the preceding. These additions begin at the stations mentioned, and that at Prairie Junction continues to the next correction. Four feet of the discrepancy between the Blue Earth River and Prairie Junction are allowed at the east end and 3 feet at the west end of the intervening portion. With these adjustments, the greater part of the series is known to be correct, and the limits of error in other parts nowhere exceed 4 feet.

| | From LaCrosse | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| La Crosse Bridge, extreme low water of the Mississippi River, 628.0; extreme high water (1880), 643.5 | 2.8 | 628-643.5 |
| Junction with the River division, near west end of bridge. | 3.2 | 655 |
| La Crescent | 4.1 | 649 |
| Junction with the Dubuque division | 6.4 | 643 |
| Root River bridge | 7.6 | 650 |
| Hokah | 9.9 | 651 |
| Root River bridge | 15.0 | 665 |
| Mound Prairie | 16.2 | 662 |
| Root River bridge | 18.0 | 671 |
| Houston | 23.1 | 681 |
| Root River bridge | 26.6 | 705 |
| Money Creek Station | 27.5 | 701 |
| Rushford | 34.8 | 724 |
| Peterson | 39.8 | 758 |
| Whalan | 49.1 | 788 |
| Root River bridge | 52.0 | 803 |
| Root River bridge | 53.5 | 826 |
| Lanesboro | 54.0 | 843 |
| Root River bridge | 57.7 | 875 |
| Isinour's | 59.6 | 901 |
| Fountain | 65.3 | 1304 |
| Depression, grade | 66.6 | 1261 |
| Summit, grade | 70.7 | 1332 |
| Wykoff | 72.4 | 1312 |
| Summit, grade | 74.5 | 1269 |
| Spring Valley | 79.6 | 1268 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

SOUTHERN MINNESOTA DIVISION—Continued.

| | From La Crosse. | Above the sea. |
|--|-----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Summit, grade | 86.1 | 1360 |
| Grand Meadow | 89.0 | 1340 |
| Depression, grade | 91.2 | 1319 |
| Dexter | 95.7 | 1416 |
| Brownsdale | 104.0 | 1275 |
| Red Cedar River, water | 108.9 | 1199 |
| Ramsey, crossing the Iowa and Minnesota division | 109.1 | 1221 |
| Turtle Creek, water, 1,192; grade | 113.7 | 1205 |
| Oakland | 115.9 | 1273 |
| Summit, grade | 119.8 | 1278 |
| Depression, grade | 123.6 | 1249 |
| Hayward | 124.0 | 1256 |
| Summit, grade | 127.5 | 1271 |
| Depression, grade | 130.2 | 1214 |
| Albert Lea | 130.6 | 1229 |
| Crossing the Burlington, Cedar Rapids and Northern and Minneapolis and St. Louis Railways | 130.7 | 1228 |
| Summit, grade | 134.9 | 1331 |
| Armstrong | 135.8 | 1278 |
| Summit, grade | 139.5 | 1325 |
| Alden | 141.2 | 1269 |
| Evans | 145.8 | 1197 |
| Wells | 150.3 | 1161 |
| Junction of the Mankato Branch | 150.6 | 1153 |
| Easton | 159.3 | 1054 |
| Summit, grade | 163.1 | 1085 |
| Delavan | 165.3 | 1065 |
| Depression, grade | 165.6 | 1055 |
| Crossing the Blue Earth Branch of the Chicago, St. Paul, Minneapolis and Omaha Railway | 172.2 | 1103 |
| Winnebago City | 172.4 | 1104 |
| Blue Earth River, water | 174.5 | 1022 |
| Fairmont | 189.4 | 1188 |
| Sherburne | 202.9 | 1285 |
| Top of bluff at junction of branch to Jackson depot | 214.5 | 1458 |
| Des Moines River, water, 1,300; grade | 217.2 | 1365 |
| Summit, grade | 222.9 | 1529 |
| Lakefield | 226.9 | 1475 |
| Okabena | 235.3 | 1422 |
| Prairie Junction, crossing the Chicago, St. Paul, Minne- apolis and Omaha Railway | 238.4 | 1429 |
| Kinbrae (De Forest) | 245.7 | 1461 |
| Graham Lakes, water | 245.7 | 1448 |
| Fulda | 252.2 | 1523 |
| Iona | 262.2 | 1623 |
| Summit, grade | 266.0 | 1720 |
| Entering the Chanarambie Valley, grade | 270.6 | 1649 |
| Chanarambie Creek, water at last crossing | 279.7 | 1536 |
| Edgerton | 281.2 | 1565 |
| Rock River, water | 284.2 | 1567 |
| Hatfield | 288.2 | 1677 |
| Summit, highest on this division, grade | 290.7 | 1759 |
| Pipestone | 295.3 | 1708 |
| Pipestone Creek, water | 299.0 | 1592 |
| Airlie | 301.4 | 1644 |
| Flandreau | 310.1 | 1565 |
| Big Sioux River, water | 312.6 | 1510 |
| Egan | 314.5 | 1525 |
| Sioux Falls Junction, Sioux City and Dakota division | 316.4 | 1514 |
| Summit, grade | 321.5 | 1713 |
| Summit, grade | 335.0 | 1723 |
| Summit, grade | 337.3 | 1733 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

SOUTHERN MINNESOTA DIVISION—Continued.

| | From LaCrosse. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Madison Lake, 2 miles south of last, water | 337.3 | 1594 |
| Madison, junction of line to Bristol | 339.6 | 1669 |
| Lake Herman, water, 1664; grade | 342.0 | 1672 |
| Summit of morainic hills, approximately | 348.8 | 1850 |
| Top of river bluff | 349.0 | 1750 |
| East Vermilion River near Winfred, water | 350.9 | 1625 |
| Top of river bluff | 352.3 | 1712 |
| Top of river bluff | 359.1 | 1601 |
| West Vermilion River, water | 360.8 | 1536 |
| Howard | 361.3 | 1564 |
| Bone Creek, bed, 1,477; grade | 363.8 | 1487 |
| Top of creek bluff | 367.4 | 1422 |
| Rock (or Red Stone) Creek, bed, 1,382; water, 1,385; grade | 367.7 | 1404 |
| Top of creek bank | 368.3 | 1410 |
| Little Jim Flats | 377.4 | 1311 |
| Artesian | 380.9 | 1313 |
| Top of river bluff | 388.1 | 1284 |
| James River, about 160 feet wide, water, 1,213; grade .. | 389.6 | 1238 |
| Forestburg | 390.4 | 1231 |
| Prairie 5 miles west of James River | 394.6 | 1278 |
| Woonsocket, junction with the James River division | 399.4 | 1308 |

MANKATO BRANCH.

Agreeing at Mankato with the Chicago, St. Paul, Minneapolis and Omaha Railway and with the survey of the Minnesota River by United States engineers.

| | From LaCrosse. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Junction with the Southern Minnesota division, main line, near Wells | 150.6 | 1153 |
| Minnesota Lake Station | 158.8 | 1046 |
| Mapleton | 167.4 | 1039 |
| Maple River, water | 174.5 | 943 |
| Good Thunder | 175.2 | 982 |
| Rapidan | 181.5 | 987 |
| Le Sueur River, water, 780; grade | 183.9 | 833 |
| Junction, crossing the Chicago, St. Paul, Minneapolis and Omaha Railway | 187.3 | 803 |
| Mankato | 188.4 | 778 |
| Minnesota River, ordinary stage of low water, 756; ex- treme low and high water | 188.4 | 752-778 |

OWA AND DAKOTA DIVISION, MAIN LINE, NORTH MCGREGOR TO CHAMBERLAIN.

This division (with its Estherville, Okobojo, and Running Water branches), excepting the portion of the main line between North McGregor and Algona, is from George B. Woodworth, assistant engineer, Milwaukee.

Referred to sea level by the elevation of the Mississippi River at North McGregor, determined by United States engineers, and agreeing exactly or closely with connecting railways and other branches of this system at Calmar, Mason City, Garner, Britt, Emmetsburg, Sheldon, Canton Junction, Parker, Marion Junction, and Mitchell, and with the elevation of the Missouri River at Chamberlain, determined by the Missouri River Commission.

Between Calmar and Mason City this accordance is furnished by the profiles of the Iowa and Minnesota Division from Calmar to Austin and of the Austin and Mason City line; but on the profile of this main line a discrepancy of 10 feet exists in this

distance, by which Mason City would be placed too low. Approximate comparisons with intersecting railways at New Hampton and Nora Junction indicate that this discrepancy probably lies between these stations; and therefore half of it is allowed at each end of the intervening portion.

A further discrepancy of 5 feet exists between Mason City and Britt, which would lower the crossing of the Minneapolis and St. Louis Railway at Britt and the line thence westward. Three feet of this is allowed at the east end of the intervening portion, and 2 feet at its west end.

From North McGregor to Calmar, and from Britt to Chamberlain, the profile has received no adjustments. An exact comparison is supplied by the Sioux City and Dakota division at Sioux Falls, where it is in agreement with the Chicago, St. Paul, Minneapolis and Omaha and the Burlington, Cedar Rapids and Northern Railways. Together with its connections through the Sioux City and Dakota division, it gives elevations of the Missouri River, stated to be low water, at Sioux City and Chamberlain, which are respectively about 5 and 7 feet above the elevations of extreme low water determined by the Missouri River Commission. It is probable, however, that these are harmonious, the reference of the railway profiles being not to extreme low water, but to the average low stage of the river as it is maintained through the greater part of the year; for a comparison with the Missouri River at Yankton is supplied by Mr. E. D. Palmer, city engineer, showing that this railway there agrees with the leveling of the Missouri River Commission, or possibly falls 1 or 2 feet lower.

| | From North McGregor. | Above the sea. |
|---|-------------------------|----------------|
| | Miles. | Feet. |
| Mississippi River at North McGregor, extreme low and high water..... | 0·0 | 604-626 |
| North McGregor..... | 0·0 | 625 |
| (Grade at 4·1 miles, 753; at 7·6 miles, near Beulah, 869; and at 11·2 miles, 1,053 feet.) | | |
| Monona..... | 14·1 | 1209 |
| Summit, cutting 3 feet; grade..... | 14·2 | 1213 |
| Luana..... | 17·9 | 1120 |
| Depression, filling 6 feet; grade..... | 18·3 | 1106 |
| Summit, cutting 5 feet; grade..... | 20·8 | 1197 |
| Line of Clayton and Allamakee Counties, grade..... | 22·6 | 1182 |
| Creek, bed, 1,132; grade..... | 23·3 | 1149 |
| Postville..... | 24·5 | 1195 |
| Summit, cutting 5 feet; grade..... | 25·2 | 1214 |
| Line of Allamakee and Winneshiek Counties, grade..... | 26·6 | 1205 |
| Castalia..... | 30·6 | 1245 |
| Ossian..... | 35·7 | 1269 |
| Creek, bed, 1,224; grade..... | 41·1 | 1246 |
| Calmar, junction with the Iowa and Minnesota division, 172·5 miles from Minneapolis..... | 42·0 | 1257 |
| Turkey River, water, 990; grade..... | 47·3 | 1006 |
| Fort Atkinson..... | 47·7 | 1011 |
| Summit, cutting 7 feet; grade..... | 52·5 | 1174 |
| Little Turkey River, water, 1,047; grade..... | 55·2 | 1064 |
| Summit, cutting 16 feet; grade..... | 57·8 | 1148 |
| Crane Creek, water, 1,061; grade..... | 59·6 | 1073 |
| Summit, cutting 22 feet; grade..... | 62·0 | 1178 |
| Summit, cutting 15 feet; grade..... | 62·9 | 1196 |
| Plum Creek, water, 1,106; grade..... | 64·8 | 1118 |
| East Wapsipinicon River, water, 1,098; grade..... | 66·5 | 1110 |
| New Hampton, near crossing of the Chicago, St. Paul and Kansas City Railway..... | 69·0 | 1154 |
| Middle Wapsipinicon River, water, 1,054; grade..... | 72·8 | 1070 |
| Chickasaw (a summit of grade)..... | 76·6 | 1141 |
| Beaver Brook, water, 995; grade..... | 80·8 | 1008 |
| Little Cedar River, water, 1,001; grade..... | 82·5 | 1013 |
| Summit, cutting 5 feet; grade..... | 85·4 | 1126 |
| Crossing the Minnesota Branch of the Illinois Central Railroad..... | 88·1 | 1013 |
| Charles City..... | 88·5 | 1005 |
| Red Cedar River, water, 988; grade..... | 89·6 | 1001 |
| Summit, natural surface and grade..... | 93·5 | 1080 |
| Summit, natural surface and grade..... | 98·9 | 1125 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

IOWA AND DAKOTA DIVISION—Continued.

| | From North McGregor. | Above the sea. |
|--|-------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Flood Creek, water, 1,076; grade..... | 101.5 | 1093 |
| Summit, cutting 3 feet; grade..... | 104.0 | 1118 |
| Shell Rock River near Nora Junction, Burlington, Cedar Rapids and Northern Railway, water, 1,031; grade.... | 106.4 | 1051 |
| Summit, cutting 8 feet; grade..... | 109.0 | 1130 |
| Lime Creek, water, 1,050; grade..... | 112.5 | 1069 |
| Crossing the Central Iowa Railway, Mason City..... | 115.65 | 1127 |
| Junction with the Austin and Mason City Line, Iowa and Minnesota division..... | 115.8 | 1127 |
| Mason City, 143.4 miles from Minneapolis..... | 116.0 | 1128 |
| Summit, natural surface and grade..... | 119.1 | 1195 |
| Crane Creek, water, 1,158; grade..... | 120.4 | 1166 |
| Willow Creek, water, 1,164; grade..... | 121.0 | 1172 |
| Same, water, 1,176; grade..... | 122.4 | 1184 |
| Clear Lake Station..... | 125.6 | 1238 |
| Summit, cutting 4 feet; grade..... | 131.5 | 1273 |
| Garr er, crossing branch of the Burlington, Cedar Rapids and Northern Railway..... | 137.0 | 1209 |
| East Fork of Iowa River, water, 1,201; grade..... | 137.9 | 1211 |
| West Fork of Iowa River, water, 1,204; grade..... | 144.3 | 1217 |
| Crossing the Minneapolis and St. Louis Railway..... | 146.1 | 1213 |
| Britt..... | 147.1 | 1235 |
| Summit, cutting 3 feet; grade..... | 155.1 | 1272 |
| Wesley..... | 156.8 | 1257 |
| Algona..... | 163.2 | 1194 |
| East Fork of Des Moines River, water, 1,105; grade.... | 169.9 | 1130 |
| Whittemore..... | 179.4 | 1206 |
| Emmetsburg, junction of the Estherville Branch..... | 192.4 | 1237 |
| Des Moines River, here, about..... | 192.4 | 1190 |
| Ruthven..... | 203.7 | 1434 |
| Spencer, junction of the Okoboji Branch..... | 216.5 | 1319 |
| Hartley..... | 233.3 | 1458 |
| Sanborn..... | 242.4 | 1552 |
| Sheldon, near crossing of the Chicago, St. Paul, Minne- apolis and Omaha Railway..... | 252.7 | 1415 |
| Boyd..... | 259.8 | 1423 |
| Hull..... | 266.5 | 1433 |
| Summit, grade..... | 268.2 | 1460 |
| Rock Valley..... | 275.1 | 1253 |
| Rock River, water, 1,226; grade..... | 275.2 | 1248 |
| Inwood (a summit of grade)..... | 285.1 | 1471 |
| Big Sioux River, bed, 1,225; water, 1,228; grade..... | 291.6 | 1250 |
| Canton..... | 294.6 | 1248 |
| Canton Junction, crossing the Sioux City and Dakota division..... | 295.2 | 1263 |
| Worthing..... | 303.8 | 1364 |
| Leunox..... | 310.6 | 1354 |
| Depression, Saddle Creek, natural surface, 1,324; grade. Summit, natural surface and grade..... | 311.8 | 1330 |
| Vermilion River, bed, 1,286; grade..... | 314.2 | 1376 |
| Parker, near crossing of the Chicago and Northwestern Railway..... | 319.3 | 1302 |
| West Fork of Vermilion River, bed, 1,326; water, 1,328; grade..... | 323.2 | 1348 |
| Summit, natural surface and grade..... | 324.9 | 1349 |
| Marion Junction, Running Water Branch..... | 328.2 | 1485 |
| Creek, bed, 1,400; grade..... | 329.7 | 1447 |
| Summit, natural surface and grade..... | 333.2 | 1421 |
| Bridgewater..... | 338.8 | 1452 |
| Pierre Creek, bed, 1,281; grade..... | 344.8 | 1420 |
| Alexandria..... | 359.6 | 1316 |
| | 360.6 | 1352 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

IOWA AND DAKOTA DIVISION—Continued.

| | From North McGregor. | Above the sea. |
|--|-------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Johnson's Creek, bed, 1,263; grade..... | 365.1 | 1292 |
| Summit, cutting 6 feet; grade..... | 367.3 | 1341 |
| James River, bed, 1,203; water, 1,206; grade..... | 370.7 | 1220 |
| Mitchell..... | 374.0 | 1301 |
| Junction with the James River division..... | 374.7 | 1297 |
| Mount Vernon..... | 385.8 | 1413 |
| Plankinton..... | 397.6 | 1528 |
| White Lake Station..... | 409.1 | 1646 |
| Kimball..... | 421.3 | 1788 |
| Puckwana..... | 431.8 | 1546 |
| Chamberlain..... | 441.0 | 1363 |
| Missouri River here, low water..... | 441.0 | 1330 |
| (Probably this refers to the average low stage of the river through the greater part of the year. Low water November 30, 1882, was 1,324.30, according to leveling and gauge records of the Missouri River Commission; but the extreme low water of 1873 was 1 foot lower—about 1,323 feet.) | | |

ESTHERVILLE BRANCH.

This agrees with the Burlington, Cedar Rapids and Northern Railway.

| | From North McGregor. | Above the sea. |
|--|-------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Emmetsburg, junction with the Iowa and Dakota division, main line..... | 192.4 | 1237 |
| Crossing the Burlington, Cedar Rapids and Northern Railway..... | 198.4 | 1233 |
| High Lake Station..... | 206.6 | 1266 |
| Des Moines River, water, 1,236; grade..... | 207.4 | 1254 |
| Same, water, 1,250; grade..... | 213.9 | 1280 |
| Estherville..... | 214.8 | 1298 |

OKOBOJI BRANCH.

Comparison with the Burlington, Cedar Rapids and Northern Railway profile, by which the elevation of Spirit Lake is determined at 1,395 feet, indicates for this branch a subtraction of 10 feet at East Okoboji Lake, which is about 5 feet below Spirit Lake. Excepting the junction at Spencer, this subtraction is made at all the points here noted.

| | From North McGregor. | Above the sea. |
|---|-------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Spencer, junction with the Iowa and Dakota division, main line..... | 216.5 | 1319 |
| Summit, grade..... | 224.0 | 1439 |
| Outlet of Spirit and Okoboji Lakes, water, 1,365; grade.. | 228.5 | 1396 |
| East Okoboji Lake, water, 1,390; grade..... | 233.5 | 1397 |
| Spirit Lake Station..... | 237.2 | 1458 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

RUNNING WATER BRANCH.

This agrees with the elevations of the Missouri River at Yankton and Running Water, determined by the Missouri River Commission.

| | From North McGregor. | Above the sea. |
|--|-------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Marion Junction, Iowa and Dakota division, main line .. | 329.7 | 1447 |
| Freeman..... | 340.1 | 1511 |
| Menno..... | 351.0 | 1324 |
| James River, water, 1,178; grade | 355.3 | 1189 |
| James River Station | 355.7 | 1193 |
| Scotland..... | 360.8 | 1347 |
| Junction of Yankton and Scotland line..... | 361.8 | 1364 |
| Tyndall..... | 373.8 | 1418 |
| Springfield..... | 385.5 | 1234 |
| Running Water..... | 392.1 | 1220 |
| (Missouri River here, low water November 18-30, 1881, 1,203.50 (Missouri River Commission); extreme low water, about 1,201.50 feet. The railway profile agrees with this, at least approximately; but it fails to note the elevation of the river, so that no exact comparison is supplied.) | | |

SIOUX CITY AND DAKOTA DIVISION, MAIN LINE, SIOUX CITY TO EGAN.

This line and its branch to Yankton and Scotland are from George B. Woodworth assistant engineer, Milwaukee.

It agrees with connecting railways and other divisions and branches of this system at Elk Point, Hawarden, Canton Junction, and Sioux Falls, and with leveling by the Missouri River Commission at Sioux City.

| | From Sioux City. | Above the sea. |
|---|---------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Sioux City..... | 0.0 | 1104 |
| Missouri River here, low water | 0.0 | 1081 |
| (Probably this refers, as at Chamberlain, on the Iowa and Dakota division, to the average low stage of the river. Its extreme low and high water at Sioux City, determined by the Missouri River Commission, are 1,076.5-1,099 feet.) | | |
| On river bluff, heavy side-cutting..... | 1.5 | 1154 |
| Big Sioux River, water, 1,088; grade | 2.6 | 1112 |
| McCook..... | 7.7 | 1112 |
| Jefferson..... | 12.5 | 1118 |
| Elk Point, junction of the Yankton and Scotland line..... | 21.0 | 1131 |
| Big Sioux River, water, 1,098; grade..... | 24.5 | 1117 |
| Westfield..... | 27.7 | 1131 |
| Akron..... | 33.2 | 1155 |
| Crossing the Chicago and Northwestern Railway, Hawarden..... | 45.2 | 1178 |
| Calliope..... | 46.2 | 1182 |
| Big Sioux River, water, 1,162; grade..... | 49.0 | 1189 |
| Eden..... | 55.0 | 1222 |
| Big Sioux River, water, 1,169; grade | 56.0 | 1199 |
| Austin..... | 57.8 | 1204 |
| Big Sioux River, water, 1,181; grade..... | 58.0 | 1204 |
| Fairview..... | 61.7 | 1214 |
| Big Sioux River, water, 1,186; grade | 62.0 | 1214 |
| Beloit..... | 68.2 | 1240 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

SIOUX CITY AND DAKOTA DIVISION.—Continued.

| | From Sioux City. | Above the sea. |
|--|------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Big Sioux River, water, 1,224; grade..... | 68·4 | 1239 |
| Canton Junction, crossing the Iowa and Dakota division..... | 70·2 | 1263 |
| Harrisburg..... | 82·8 | 1449 |
| Summit, grade..... | 85·0 | 1502 |
| Crossing the Burlington, Cedar Rapids and Northern Railway..... | 88·0 | 1406 |
| Big Sioux River, low and high water, 1,373–1,378; grade..... | 90·5 | 1395 |
| (This is close below the upper dam of Sioux Falls, that of the Cascade Mills, owned by Emerson, Sherman & Co., which has a head of 10 feet, from 1,383 to 1,373 feet. | | |
| Canal of the Queen Bee Mills, owned by the Sioux Falls Water Power Company, 1,373; tail-race of same, 1,317; the head or fall used being 56 feet. | | |
| Pond of the lowest dam, that of the Sioux Falls Mills, owned by Webber, Shaw & Martin, 1,317. This has 10 feet head. Low water in the river below it, 1,307 feet above the sea, is taken as zero of the Sioux Falls city system of levelings.) | | |
| Sioux Falls..... | 90·6 | 1393 |
| D. C. Rice, city engineer, supplies the following elevations of track at depots in Sioux Falls: | | |
| Chicago, Milwaukee and St. Paul..... | | 1393 |
| Chicago, St. Paul, Minneapolis and Omaha..... | | 1397 |
| Illinois Central..... | | 1397 |
| Burlington, Cedar Rapids and Northern..... | | 1400 |
| Top of steeply ascending grade from Sioux Falls..... | 91·7 | 1422 |
| Big Sioux River, water..... | 109·2 | 1470 |
| Dell Rapids..... | 109·5 | 1485 |
| Big Sioux River, water..... | 116·4 | 1479 |
| Big Sioux River, water..... | 121·5 | 1497 |
| Sioux Falls Junction, Southern Minnesota division..... | 122·3 | 1514 |
| Egan..... | 124·2 | 1525 |

ELK POINT TO YANKTON, SCOTLAND, ARMOUR, AND MITCHELL.

Agreeing at Yankton with the Chicago and Northwestern Railway and with leveling by the Missouri River Commission, at Scotland with the Running Water Branch, and at Mitchell with the Iowa and Dakota division.

| | From Sioux City. | Above the sea. |
|--|------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Elk Point, junction with the foregoing..... | 21·0 | 1131 |
| Burbank..... | 29·6 | 1142 |
| Vermilion..... | 35·5 | 1150 |
| Vermilion River, water, 1,129; grade..... | 37·0 | 1150 |
| Meckling..... | 43·8 | 1156 |
| Gayville..... | 50·0 | 1167 |
| James River, water, 1,161; grade..... | 57·0 | 1177 |
| Junction of the spur to Yankton..... | 60·0 | 1180 |
| Yankton (on spur, 1·4 miles from main line)..... | 61·4 | 1196 |
| Missouri River here, low water November 24, 1881, 1,160·76; extreme low and high water, about..... | 61·4 | 1157–1198 |
| Summit, grade..... | 65·3 | 1358 |
| Utica..... | 69·0 | 1387 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

ELK POINT TO YANKTON, ETC.—Continued.

| | From Sioux City. | Above the sea. |
|---|------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Depression, grade | 73.0 | 1299 |
| Lesterville | 77.0 | 1385 |
| Junction with the Running Water Branch | 87.1 | 1364 |
| Scotland | 88.1 | 1347 |
| Tripp | 101.6 | 1563 |
| On branch from Tripp west to Armour: | | |
| Summit, grade | 104.1 | 1595 |
| Delmont | 111.6 | 1488 |
| Armour | 121.6 | 1521 |
| On line from Tripp north to Mitchell: | | |
| Parkston | 113.7 | 1400 |
| Ethau | 124.2 | 1345 |
| Mitchell, junction with the Iowa and Dakota and James River divisions | 135.8 | 1301 |

MADISON TO BRISTOL, AND ANDOVER TO HARLEM.

Agreeing with the Southern Minnesota and Hastings and Dakota divisions, and with other intersecting railways.

| | From Madison. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Madison, on the Southern Minnesota division, 339.6 miles from La Crosse | 0.0 | 1669 |
| Ramona (a summit of grade) | 10.3 | 1801 |
| Oldham | 19.9 | 1721 |
| Lake Whitewood, water, 1,687; grade on bridge | 26.6 | 1694 |
| Lake Preston Station | 30.3 | 1722 |
| Crossing the Chicago and Northwestern Railway | 30.5 | 1724 |
| Erwin (a summit of grade) | 40.0 | 1860 |
| Bryant | 47.5 | 1844 |
| Kent, crossing the Watertown and Huron Branch of the St. Paul, Minneapolis and Manitoba Railway | 54.1 | 1829 |
| Naples | 60.6 | 1791 |
| Crossing the Chicago and Northwestern Railway | 68.9 | 1814 |
| East Elrod | 69.4 | 1818 |
| Garden City | 74.3 | 1853 |
| Summit, grade | 75.8 | 1862 |
| Bradley | 84.4 | 1796 |
| Summit, grade | 89.9 | 1862 |
| Butler | 96.7 | 1820 |
| Bristol, Hastings and Dakota division, 247.6 miles from Minneapolis | 103.2 | 1775 |
| Andover, Hastings and Dakota division, junction of branch to Harlem | 113.2 | 1476 |
| Pierpont (a summit of grade) | 120.5 | 1512 |
| Langford | 128.1 | 1372 |
| Spain | 135.3 | 1327 |
| Britton | 141.6 | 1354 |
| Newark | 151.6 | 1308 |
| Brampton | 156.1 | 1291 |
| Sargent | 161.8 | 1303 |
| Crossing the Minneapolis and Pacific Railway | 163.8 | 1298 |
| Harlem | 168.8 | 1323 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

JAMES RIVER DIVISION, MITCHELL TO ELLENDALE AND EDGELEY.

This agrees exactly or closely with connecting railways and other branches of this system at Woonsocket, Wolsey, Redfield, Aberdeen, Ellendale, and Edgeley.

| | From Mitchell. | Above the sea. |
|--|----------------|----------------|
| | Miles. | Feet. |
| Mitchell, 374 miles from North McGregor..... | 0·0 | 1301 |
| Junction with the Iowa and Dakota division..... | 0·7 | 1297 |
| Letcher..... | 15·0 | 1300 |
| Depression (Long Lake) filling 6 feet; grade..... | 19·2 | 1289 |
| Summit, natural surface and grade..... | 22·5 | 1315 |
| Woonsocket, junction with the Southern Minnesota division..... | 28·2 | 1308 |
| Sand Creek, bed, 1,310; top of creek bank, 1,316; grade.. | 35·8 | 1319 |
| Alpena..... | 38·0 | 1319 |
| Summit, natural surface and grade..... | 42·8 | 1363 |
| Virgil..... | 46·4 | 1341 |
| Depression, filling 6 feet; grade..... | 48·7 | 1316 |
| Wolsey..... | 54·6 | 1353 |
| Crossing the main line of the Dakota division of the Chicago and Northwestern Railway..... | 55·0 | 1352 |
| Cain Creek, bed, 1,320; grade..... | 57·1 | 1329 |
| Summit, cutting 4 feet; grade..... | 59·2 | 1360 |
| Bonilla..... | 67·0 | 1338 |
| Tulare..... | 77·7 | 1317 |
| Depression, filling 7 feet; grade..... | 80·0 | 1297 |
| Summit, natural surface and grade..... | 81·9 | 1331 |
| Crossing the Columbia Branch of the Chicago and North-western Railway..... | 85·7 | 1296 |
| Redfield..... | 87·2 | 1295 |
| Crossing the Watertown line of the Chicago and North-western Railway..... | 87·4 | 1294 |
| Turtle Creek, bed, 1,254; top of creek bank, 1,274; grade. | 87·8 | 1278 |
| Snake Creek, bed, 1,248; top of creek bank, 1,270; grade.. | 93·3 | 1270 |
| Ashton..... | 95·7 | 1296 |
| Ravine, bottom, 1,283; grade..... | 100·3 | 1300 |
| Mellette..... | 106·7 | 1300 |
| Ravine, bottom, 1,276; grade..... | 116·6 | 1290 |
| Warner..... | 118·4 | 1301 |
| Ravine, bottom, 1,281; grade..... | 122·3 | 1291 |
| Crossing the Columbia Branch of the Chicago and North-western Railway..... | 125·5 | 1299 |
| Aberdeen, junction with the Hastings and Dakota di- vision..... | 128·3 | 1300 |
| Summit, grade..... | 139·3 | 1361 |
| Westport..... | 141·1 | 1333 |
| Elm River, bed, 1,318; top of river bank, 1,330; grade... | 141·3 | 1333 |
| Summit, natural surface and grade..... | 150·6 | 1401 |
| Frederick..... | 153·9 | 1371 |
| Maple River, bed, 1,359; grade..... | 154·4 | 1371 |
| Summit, natural surface and grade..... | 161·1 | 1440 |
| Depression, filling 12 feet; grade..... | 161·6 | 1419 |
| Ellendale, near crossing of the St. Paul, Minneapolis and Manitoba Railway..... | 165·7 | 1449 |
| Duane..... | 170·6 | 1478 |
| Monango, near crossing of the Minneapolis and Pacific Railway..... | 178·1 | 1503 |
| Summit, grade..... | 191·4 | 1566 |
| Edgeley, near crossing of branch of the Northern Pacific Railroad..... | 192·2 | 1556 |

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

ORIENT TO EUREKA.

Referred to sea level by the line from Aberdeen, and agreeing (at least approximately) with the Chicago and Northwestern Railway.

| | From Orient. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Orient | 0·0 | 1599 |
| Faulkton, near crossing of the Chicago and Northwestern Railway | 9·3 | 1573 |
| Millard | 18·3 | 1640 |
| Loyalton | 29·0 | 1685 |
| Roscoe, 328 miles from Minneapolis, on line from Aberdeen to Bowdle | 41·3 | 1826 |
| Hosmer | 52·4 | 1901 |
| Hillsview | 59·6 | 1849 |
| Eureka | 67·6 | 1884 |

CHICAGO AND NORTHWESTERN RAILWAY.

[From John E. Blunt, engineer, Winona.]

MINNESOTA (WINONA AND ST. PETER) DIVISION, AND ITS EXTENSION IN SOUTH DAKOTA. MAIN LINE, FROM WINONA TO ST. PETER, TRACY, WATERTOWN, REDFIELD, AND GETTYSBURG.

Referred to sea level by the elevation of the Mississippi River at Winona, determined by United States engineers, and agreeing exactly or closely with connecting railways and other divisions and branches of this system at Winona, Zumbrota Junction, Dodge Centre, Owatonna, Waseca, Kasota, Redwood Junction, Tracy, Watertown, Doland, and Redfield.

| | From Winona. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Winona, extreme low and high water of the Mississippi River | 0·0 | 639·19-656·27 |
| Top of rail on drawbridge | 0·0 | 670 |
| Winona, passenger depot | 0·0 | 668 |
| Winona, railroad yard and freight depot | 0·0 | 649 |
| Minnesota City | 5·9 | 676 |
| Stockton | 11·3 | 753 |
| Lewiston | 18·3 | 1211 |
| Utica | 22·7 | 1170 |
| St. Charles | 28·3 | 1139 |
| Dover | 32·2 | 1138 |
| Eyota | 36·9 | 1237 |
| Chatfield Junction | 37·7 | 1275 |
| Plainview Junction | 37·9 | 1275 |
| Chester | 42·7 | 1122 |
| Rochester | 49·2 | 991 |
| Zumbrota Junction | 50·6 | 999 |
| Olmsted | 54·2 | 1054 |
| Byron | 58·7 | 1250 |
| Kasson | 63·9 | 1252 |
| Dodge Centre, near crossing of the Chicago, St. Paul and Kansas City Railway | 69·2 | 1288 |
| Claremont | 76·3 | 1280 |
| Havana | 83·9 | 1246 |
| Owatonna, near crossing of the Iowa and Minnesota division of the Chicago, Milwaukee and St. Paul Railway | 88·2 | 1144 |
| Meriden | 96·3 | 1149 |
| Waseca, near crossing of the Minneapolis and St. Louis Railway | 102·6 | 1153 |
| Janesville | 112·9 | 1063 |
| Eagle Lake Station | 122·5 | 1012 |
| Mankato Junction | 128·0 | 906 |

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

MINNESOTA DIVISION, ETC.—Continued.

| | From Winona. | Above the sea. |
|--|--------------|----------------|
| | Miles. | Feet. |
| Mankato (on spur, 3 miles from main line)..... | 131.0 | 781 |
| Kasota, junction with Chicago, St. Paul, Minneapolis and Omaha Railway..... | 133.8 | 804 |
| Minnesota River, low and high water, 733-755; grade.... | 135.0 | 791 |
| St. Peter..... | 136.2 | 812 |
| Oshawa..... | 146.3 | 982 |
| Nicollet..... | 150.9 | 980 |
| Courtland..... | 158.5 | 936 |
| Minnesota River, low and high water, 782-807; grade.... | 162.5 | 821 |
| New Ulm..... | 165.3 | 837 |
| Milford..... | 169.0 | 994 |
| Sleepy Eye..... | 179.7 | 1034 |
| Redwood Junction, Redwood Falls Branch..... | 180.7 | 1015 |
| Springfield..... | 193.2 | 1025 |
| Sanborn..... | 201.5 | 1089 |
| Lamberton..... | 208.8 | 1144 |
| Walnut Grove..... | 219.0 | 1223 |
| Tracy, junction of the Dakota division..... | 226.5 | 1403 |
| Amiret..... | 233.6 | 1283 |
| Marshall, near crossing of the Willmar and Sioux Falls (St. Paul, Minneapolis and Manitoba) Railway..... | 243.8 | 1174 |
| Grand View..... | 250.7 | 1173 |
| Minneota..... | 256.5 | 1179 |
| Canby..... | 274.0 | 1243 |
| Gary..... | 284.6 | 1484 |
| Altamont..... | 297.4 | 1834 |
| Goodwin (crest of the Coteau des Prairies)..... | 305.9 | 1996 |
| Kranzburg..... | 309.5 | 1982 |
| Watertown, junction with line from Brookings..... | 319.1 | 1733 |
| (According to Mr. George W. Carpenter, county sur- veyor, Watertown, this depot is 1 foot below that of the Minneapolis and St. Louis and Burlington, Cedar Rapids and Northern Railways, and 7 feet above that of the St. Paul, Minneapolis and Mani- toba Railway.) | | |
| Crossing the St. Paul, Minneapolis and Manitoba Rail- way..... | 319.8 | 1726 |
| Big Sioux River, low and high water..... | 320.0 | 1709-1715 |
| Lake Kampeska, water..... | 322.0 | 1714 |
| Kampeska..... | 327.3 | 1766 |
| Henry..... | 337.0 | 1812 |
| Elrod, near crossing of the Chicago, Milwaukee and St. Paul Railway..... | 342.3 | 1807 |
| Clark Centre..... | 350.2 | 1789 |
| Summit, grade..... | 351.5 | 1854 |
| Raymond..... | 361.4 | 1458 |
| Doland, junction of the Groton Branch..... | 369.4 | 1355 |
| Frankfort..... | 379.4 | 1296 |
| James River, water..... | 380.8 | 1240 |
| Redfield, junction with line from Huron to Oakes..... | 390.2 | 1300 |
| Zell..... | 400.8 | 1365 |
| Rockham..... | 405.4 | 1394 |
| Miranda..... | 413.8 | 1447 |
| Crossing the Chicago, Milwaukee and St. Paul Railway..... | 422.3 | 1582 |
| Faulton..... | 422.7 | 1595 |
| Snake Creek, low water..... | 424.0 | 1558 |
| Burkmere..... | 432.2 | 1748 |
| Seneca..... | 442.0 | 1911 |
| Summit, grade..... | 451.8 | 2045 |
| Lebanon (in the Blue Blanket Valley)..... | 455.1 | 1956 |
| Summit, grade..... | 464.0 | 2104 |
| Gettysburg..... | 465.5 | 2082 |

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

CHATFIELD BRANCH.

| | From Winona. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Chatfield Junction, Minnesota division, main line | 37.7 | 1275 |
| Summit, grade | 40.7 | 1295 |
| Chatfield | 48.9 | 976 |

PLAINVIEW BRANCH.

| Plainview Junction, Minnesota division, main line | 37.9 | 1275 |
|---|------|------|
| Doty | 40.0 | 1310 |
| Viola | 43.0 | 1129 |
| Whitewater Creek, grade | 47.0 | 1055 |
| Elgin | 48.2 | 1069 |
| Plainview | 52.9 | 1167 |

ZUMBROTA BRANCH.

Agreeing at Zumbrota with the Wabasha division of the Chicago, Milwaukee and St. Paul Railway.

| | From Winona. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Zumbrota Junction, Minnesota division, main line | 50.6 | 999 |
| Douglas | 58.2 | 1091 |
| South Middle Branch of Zumbro River, water, 966; grade | 60.2 | 986 |
| Oronoco | 61.7 | 1041 |
| North Middle Branch of Zumbro River, water, 984; grade | 65.2 | 993 |
| Pine Island | 65.8 | 998 |
| Lena | 70.6 | 1073 |
| Forest Mills | 73.1 | 1023 |
| Zumbrota | 74.5 | 971 |

REDWOOD FALLS BRANCH.

Agreeing at Redwood Falls with leveling from the Minneapolis and St. Louis Railway.

| | From Winona. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Redwood Junction, Minnesota division, main line | 180.7 | 1015 |
| Morgan | 193.2 | 1050 |
| Paxton | 199.4 | 1039 |
| Redwood Falls | 205.7 | 1033 |
| Redwood River here, at the head of the falls | 205.7 | 953 |
| Same, at the Minneapolis and St. Louis Railway bridge, below the falls, 2½ miles northeast from the last | | 831 |

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

GROTON BRANCH.

Agreeing at Groton with the Hastings and Dakota division of the Chicago, Milwaukee and St. Paul Railway.

| | From Winona. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Doland, junction with extension of the Minnesota division, main line..... | 369.4 | 1355 |
| Turton..... | 380.3 | 1323 |
| Conde..... | 387.8 | 1313 |
| Verdon..... | 393.8 | 1304 |
| Ferney..... | 399.6 | 1300 |
| Groton, junction with the Chicago, Milwaukee and St. Paul Railway..... | 408.2 | 1301 |

DAKOTA DIVISION, MAIN LINE, TRACY TO PIERRE.

This agrees exactly or closely with connecting railways and other branches of this system at Elkton, Watertown Junction, Iroquois, James Valley Junction, and Wolsey. At Pierre the elevation of the Missouri River is found about 13 feet higher by this survey than by the leveling of the Missouri River Commission.

| | From Winona. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Tracy, junction with the Minnesota (Winona and St. Peter) division..... | 226.5 | 1403 |
| Balaton..... | 239.5 | 1528 |
| Redwood..... | 246.5 | 1631 |
| Redwood River, water, 1,592; grade..... | 246.6 | 1631 |
| Tyler..... | 253.7 | 1750 |
| Lake Benton Station..... | 261.5 | 1759 |
| Lake Benton, water..... | 261.5 | 1754 |
| Summit (Hole in the Mountain), grade..... | 262.5 | 1762 |
| Depression, grade..... | 265.5 | 1715 |
| Verdi..... | 267.6 | 1771 |
| Elkton, near crossing of the Burlington, Cedar Rapids and Northern Railway..... | 274.3 | 1751 |
| Aurora..... | 285.1 | 1630 |
| Summit, grade..... | 288.9 | 1683 |
| Brookings..... | 290.8 | 1636 |
| Watertown Junction..... | 294.3 | 1604 |
| Big Sioux River, water, 1,596; grade..... | 296.4 | 1607 |
| Volga..... | 297.4 | 1636 |
| Arlington (Nordland)..... | 308.3 | 1846 |
| Preston..... | 321.0 | 1696 |
| De Smet..... | 329.6 | 1726 |
| Summit, grade..... | 331.4 | 1767 |
| Manchester (Fairview)..... | 338.3 | 1542 |
| Iroquois, junction of the Hawarden line..... | 344.8 | 1401 |
| Cavour..... | 354.0 | 1311 |
| James River, water, 1,228; grade..... | 361.8 | 1270 |
| Huron..... | 362.9 | 1285 |
| James Valley Junction, line to Redfield and Oakes..... | 367.0 | 1312 |
| Wolsey, near crossing of the James River division, Chicago, Milwaukee and St. Paul Railway..... | 375.6 | 1348 |
| Wessington..... | 387.6 | 1419 |
| St. Lawrence..... | 400.3 | 1580 |
| Miller..... | 402.8 | 1587 |
| Ree Heights..... | 413.3 | 1731 |
| Bramhall..... | 419.4 | 1819 |
| Highmore..... | 425.2 | 1890 |
| Summit, grade..... | 427.4 | 1903 |
| Holabird..... | 433.0 | 1795 |

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

DAKOTA DIVISION—Continued.

| | From Winona. | Above the sea. |
|--|---------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Harold | 439·7 | 1801 |
| Medicine Creek, water | 448·0 | 1652 |
| Blunt | 452·3 | 1621 |
| Canning | 461·8 | 1553 |
| Medicine Creek, water | 467·6 | 1408 |
| Rousseau | 467·8 | 1427 |
| East Pierre | 480·7 | 1460 |
| Pierre | 482·0 | 1440 |
| Missouri River here, low water (1879), 1,428; extreme low water (1882), about 1,426; ordinary stage of high water, 1,440; extreme high water (1881), 1,445 | 482·0 | 1426-1445 |
| (According to leveling by the Missouri River Commission, low water at Pierre November 30, 1882, was 1,413·80, extreme low water being about 1,413 feet.) | | |

BROOKINGS TO WATERTOWN.

Agreeing with connecting railways at Watertown.

| | From Brook- ings. | Above the sea. |
|---|----------------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Watertown Junction, Dakota division, main line, 294·3 miles from Winona | 3·5 | 1604 |
| Bruce | 11·7 | 1640 |
| Estelline | 21·8 | 1659 |
| Dempster | 26·5 | 1666 |
| Castlewood | 34·0 | 1685 |
| Appleby | 40·6 | 1711 |
| Watertown, junction with the Minnesota division | 47·8 | 1733 |

HURON TO REDFIELD AND OAKES.

Agreeing with connecting lines at Redfield and Aberdeen; but farther north requiring a subtraction of 8 feet, which is here made, beginning at Ordway, to agree with railways at Ludden and Oakes. With this change it accords well with the known elevations of the James River, which is held level by the Columbia dam along a distance of about 30 miles to Ludden.

| | From Huron. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| James Valley Junction, Dakota division, main line, 367 miles from Winona | 4·1 | 1312 |
| Broadland | 12·4 | 1308 |
| Hitchcock | 22·2 | 1339 |
| Crandon | 32·6 | 1305 |
| Redfield, crossing the extension of the Minnesota division | 40·4 | 1300 |
| Athol | 50·4 | 1296 |
| Northville | 60·6 | 1299 |
| Mansfield | 66·6 | 1300 |
| Rudolph | 74·0 | 1301 |
| Aberdeen, junction with the Chicago, Milwaukee and St. Paul and the St. Paul, Minneapolis and Manitoba Railways | 82·6 | 1300 |
| Maple River, low water | 91·0 | 1299 |
| Ordway | 91·1 | 1306 |
| James River, below the Columbia Mills (head, 10 feet) ... | 96·0 | 1276 |

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

HURON TO REDFIELD AND OAKES—Continued.

| | From Huron. | Above the sea. |
|---|---------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Lake Columbia, James River (raised by dam 8 feet above its natural level), 1,286; grade on bridge..... | 96·5 | 1295 |
| Columbia | 96·8 | 1304 |
| Houghton | 108·5 | 1302 |
| Hecla | 117·2 | 1301 |
| Ludden | 126·1 | 1303 |
| James River, low water (level of Lake Columbia), 1 mile west of Ludden | | 1286 |
| Crossing the St. Paul, Minneapolis and Manitoba Railway | 127·6 | 1303 |
| Crossing the Minneapolis and Pacific Railway | 135·6 | 1321 |
| Oakes, connection with the Northern Pacific Railroad (James River, low water, 4 miles below La Moure, 1,287 feet.) | 136·1 | 1313 |

HAWARDEN TO IROQUOIS.

This agrees with its connecting railways.

| | From Hawarden. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Hawarden, near the crossing of the Sioux City and Dakota division of the Chicago, Milwaukee and St. Paul Railway | 0·0 | 1181 |
| Big Sioux River, water | 1·0 | 1147 |
| Alcester | 8·6 | 1346 |
| Beresford | 17·4 | 1505 |
| Centerville, junction of the Yankton Branch | 27·6 | 1229 |
| Hurley | 40·7 | 1268 |
| Parker, near crossing of the Iowa and Dakota division of the Chicago, Milwaukee and St. Paul Railway | 49·6 | 1340 |
| Canistota | 65·9 | 1455 |
| Salem, near junction with the Sioux Falls Branch of the Chicago, St. Paul, Minneapolis and Omaha Railway | 76·0 | 1517 |
| Canova | 83·1 | 1527 |
| Vilas | 98·2 | 1480 |
| Carthage | 110·7 | 1438 |
| Esmond | 117·6 | 1433 |
| Iroquois, junction with the Dakota division, main line ... | 126·2 | 1401 |

YANKTON BRANCH.

This agrees at Yankton with the Chicago, Milwaukee and St. Paul Railway, and with the elevation of the Missouri River determined by the Missouri River Commission.

| | From Centerville. | Above the sea. |
|---|-------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Centerville, junction with the foregoing | 0·0 | 1229 |
| Vermilion River, low water, 1,183; grade | 1·4 | 1204 |
| Wakonda (a summit of grade) | 10·5 | 1396 |
| Volin | 15·8 | 1181 |
| James River, low water, 1,164; grade | 24·3 | 1180 |
| Yankton | 28·5 | 1206 |
| Missouri River here, extreme low and high water, about .. | 28·5 | 1157–1198 |

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY.

[From profiles in the office of T. P. Gere, superintendent, and C. W. Johnson, engineer, St. Paul.]

EASTERN DIVISION, FROM ST. PAUL TO EAU CLAIRE.

Referred to sea level by the elevation of the Mississippi River at St. Paul, determined by United States engineers; agreeing with the determination of Lake St. Croix by United States engineers and with connecting railways at Eau Claire.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. Paul, extreme low and high water of the Mississippi River | 0·0 | 683-702 |
| St. Paul, union depot | 0·0 | 703 |
| Junction with the St. Paul, Minneapolis and Manitoba Railway | 1·3 | 775 |
| Trout Brook, bed, 754; grade | 1·4 | 781 |
| East St. Paul | 2·0 | 822 |
| Bridge over the St. Paul and Duluth Railroad, grade | 2·1 | 829 |
| St. Paul and Duluth grade | 2·1 | 809 |
| Phalen's Creek, bed, 803; grade | 2·1 | 829 |
| Post's Station | 2·9 | 847 |
| Phalen's Creek, bed, 838; grade | 3·0 | 853 |
| Phalen's Creek, bed, 853; grade | 3·4 | 871 |
| Creek, bed, 892; grade | 4·2 | 923 |
| Top of ascent from the Mississippi River, cutting 15 feet; grade | 5·8 | 988 |
| Tamarack swamp, natural surface, 973; grade | 6·3 | 978 |
| Midvale | 7·0 | 1007 |
| Summit, cutting 10 feet; grade | 7·8 | 1008 |
| Oakdale | 8·7 | 979 |
| Lake Elmo Station | 11·8 | 933 |
| Lower Bass Lake (or Lake Elmo), water | 11·8 | 886 |
| Upper Bass Lake, water | 11·8 | 900 |
| Crossing road on east line of Oakdale township, grade | 12·8 | 923 |
| Lake, water, 913; grade | 14·6 | 926 |
| Summit, grade | 15·2 | 929 |
| Stillwater Junction, of branch to Stillwater | 15·7 | 879 |
| Lakeland Junction, Stillwater Branch of the Chicago, Milwaukee and St. Paul Railway | 18·7 | 706 |
| Lake St. Croix, ordinary stage of water, 672-674; extreme low and high water, 667-687; grade on the drawbridge | 19·0 | 697 |
| River Falls Junction, of branch to River Falls | 19·2 | 697 |
| Hudson | 19·7 | 718 |
| North Wisconsin Junction, of line to Bayfield and Duluth | 22·2 | 872 |
| Chapman | 26·8 | 1011 |
| Roberts | 30·2 | 1037 |
| Hammond | 36·0 | 1102 |
| Baldwin | 39·4 | 1134 |
| Woodville | 43·8 | 1152 |
| Hersey | 48·6 | 1199 |
| Wilson | 51·0 | 1147 |
| Knapp | 55·8 | 926 |
| Menomonie Junction, of branch to Menomonie | 64·4 | 882 |
| Red Cedar River, ordinary low water, 800; high water (1881), 816; grade | 65·7 | 862 |
| Rusk | 69·1 | 902 |
| Elk Mound | 76·8 | 929 |
| West Eau Claire | 85·8 | 880 |
| Chippewa River, ordinary low water, 770; high water (1884), 792; grade | 87·3 | 848 |
| Eau Claire | 87·8 | 839 |

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

HUDSON TO BAYFIELD.

Referred to sea level by the elevations of the Mississippi River at St. Paul, of Lake St. Croix at Hudson, and of Lake Superior at Bayfield, determined by United States engineers. Compared with these elevations, the profile contains a discrepancy of 3 feet, which would make its north end too low. From Hudson to Clayton the elevations here given accord with those of St. Paul and Lake St. Croix; and thence northward, namely, from Turtle Lake (which agrees within 1 foot with the Minneapolis, Sault Ste. Marie and Atlantic Railway) to Bayfield, they accord with that of Lake Superior.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Hudson | 19·7 | 718 |
| North Wisconsin Junction, of line to Eau Claire and Chicago | 22·2 | 872 |
| Burkhardt's | 25·0 | 925 |
| Boardman | 30·0 | 949 |
| New Richmond | 35·5 | 989 |
| Orme's | 40·2 | 1057 |
| Deer Park | 44·2 | 1062 |
| Clear Lake Station | 52·5 | 1197 |
| Summit, grade | 53·8 | 1250 |
| Pineville | 55·1 | 1249 |
| Richardson | 58·3 | 1197 |
| Clayton | 60·1 | 1203 |
| Turtle Lake Station, at crossing of the Minneapolis, Sault Ste. Marie and Atlantic Railway | 64·4 | 1257 |
| Perley | 67·9 | 1249 |
| Comstock | 71·5 | 1282 |
| Sprague | 73·5 | 1257 |
| Cumberland | 77·2 | 1241 |
| Granite Lake Station | 82·6 | 1314 |
| Barronette | 84·6 | 1373 |
| Summit, grade | 86·6 | 1444 |
| Shell Lake Station | 93·4 | 1242 |
| Chicago Junction, of line to Eau Claire and Chicago | 98·1 | 1086 |
| Yellow River, water, 1,060; grade | 98·9 | 1086 |
| Spooner | 99·3 | 1095 |
| Chandler | 101·5 | 1145 |
| Superior Junction, of line to Duluth | 106·3 | 1089 |
| Veazie | 107·7 | 1084 |
| Ames | 110·9 | 1099 |
| Namekagon River, water, 1,131; grade | 119·1 | 1145 |
| Stinnett | 119·7 | 1146 |
| Hayward | 125·5 | 1194 |
| Namekagon River, water, 1,198; grade | 128·2 | 1213 |
| Phipps | 130·3 | 1234 |
| Cable | 142·0 | 1367 |
| Summit, grade | 148·0 | 1430 |
| Drummond | 151·9 | 1307 |
| Pratt's | 160·2 | 1027 |
| Forest City | 163·7 | 914 |
| White River, water, 903; grade | 166·3 | 949 |
| Mason | 166·7 | 965 |
| Ashland Junction, of branch to Ashland | 179·2 | 657 |
| Ashland, on this branch | 183·4 | 666 |
| Crossing the Wisconsin division of the Northern Pacific Railroad, near Ashland Junction | 179·6 | 653 |
| Washburn | 187·8 | 655 |
| Bayfield | 200·4 | 616 |
| Lake Superior, mean, 1871 to 1887 | 200·4 | 601·56 |

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

SUPERIOR JUNCTION TO DULUTH.

Agreeing at Gordon with the elevation of the St. Croix River, and at Duluth with that of Lake Superior, both determined by United States engineers.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Superior Junction, line to Bayfield..... | 106·3 | 1069 |
| Namekagon River, water, 1,037; grade..... | 106·7 | 1076 |
| Lake Side..... | 117·5 | 1108 |
| Totogatic River, water, 1,010; grade..... | 123·0 | 1032 |
| Gordon | 131·2 | 1024 |
| St. Croix River, water, 1,006; grade..... | 131·3 | 1022 |
| White Birch | 139·3 | 1081 |
| Summit, grade | 143·3 | 1238 |
| Hawthorne | 150·0 | 1154 |
| Aminicon River, water, 950; grade..... | 156·4 | 983 |
| South Range..... | 161·4 | 768 |
| Junction with the Northern Pacific Railroad..... | 168·9 | 635 |
| Superior..... | 169·3 | 643 |
| West Superior, junction with the Northern Pacific Railroad..... | 172·8 | 622 |
| St. Louis Bay, Lake Superior, water..... | 172·8 | 602 |
| Rice's Point, junction with the Northern Pacific Railroad..... | 174·4 | 617 |
| Duluth | 176·7 | 605 |

EAU CLAIRE TO CHICAGO JUNCTION.

The elevation of Eau Claire is in accordance with the determination of the Mississippi River at St. Paul, and of Lake St. Croix; but all the series thence northward receives an addition of 3 feet to accord with Lake Superior.

| | From Eau Claire. | Above the sea. |
|---|------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Eau Claire, 87·8 miles from St. Paul..... | 0·0 | 839 |
| South Chippewa Falls | 10·0 | 861 |
| Chippewa River, ordinary low water, 843; high water (1884), 859; grade..... | 10·7 | 869 |
| Eagle Point..... | 17·9 | 974 |
| Bloomer | 24·7 | 1013 |
| Cartwright | 33·2 | 1110 |
| Chetek River, water, 1,031; grade | 41·3 | 1046 |
| Chetek | 41·9 | 1054 |
| Cameron Junction, Minneapolis, Sault Ste. Marie and Atlantic Railway..... | 48·7 | 1100 |
| Red Cedar River, water, 1,114; grade | 56·1 | 1134 |
| Rice Lake Station..... | 56·5 | 1146 |
| Bear Creek Station..... | 64·0 | 1232 |
| Summit, grade | 68·5 | 1343 |
| Chicago Junction, of lines to Bayfield and Duluth, 98·1 miles from St. Paul. | 79·6 | 1086 |

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

WESTERN (ST. PAUL AND SIOUX CITY) DIVISION.

The profile of this division gives elevations above high water at St. Paul. It therefore receives here a constant addition of 703 feet, the mean between Major Allen's determination of it (702) and that supplied by leveling from the Gulf of Mexico under the direction of Major Mackenzie (703.75). It agrees exactly or closely with connecting railways at Mendota, Shakopee, Merriam and Kasota Junctions, Mankato, Lake Crystal, Worthington, Sibley, and Sheldon.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | Miles. | Feet. |
| St. Paul, union depot | 0.0 | 703 |
| Mendota Junction, Chicago, Milwaukee and St. Paul Railway | 5.6 | 717 |
| Nicols | 10.8 | 717 |
| Hamilton | 18.6 | 718 |
| Eagle Creek, grade | 20.6 | 712 |
| Barden (Bloomington) | 22.1 | 741 |
| Shakopee | 28.1 | 745 |
| Same, crossing the Hastings and Dakota division of the Chicago, Milwaukee and St. Paul Railway | 28.5 | 753 |
| Summit, grade | 30.1 | 757 |
| Summit, grade | 33.6 | 767 |
| Merriam Junction, Minneapolis and St. Louis Railway .. | 34.0 | 755 |
| Jordan (formerly Brentwood Station) | 39.0 | 752 |
| Summit, grade | 41.0 | 766 |
| St. Lawrence | 42.0 | 748 |
| Belle Plaine | 46.5 | 728 |
| High water of the Minnesota River here | 46.5 | 722 |
| Blakely | 50.9 | 731 |
| Creek, bed, 716; high water (of the Minnesota River), 726; grade | 51.0 | 731 |
| Cut 29 feet deep in till, at Rocky Point, section 30, Blakely; grade | 54.9 | 738 |
| High water of the Minnesota River here | 54.9 | 731 |
| East Henderson | 57.7 | 737 |
| Le Sueur Creek, water, 727; grade | 61.0 | 742 |
| Le Sueur | 62.4 | 756 |
| High water of the Minnesota River here | 62.4 | 742 |
| Ottawa | 68.6 | 793 |
| East St. Peter | 74.5 | 751 |
| Shanaska Creek, water, 744; grade | 75.8 | 782 |
| High water of the Minnesota River here | 75.8 | 753 |
| Kasota Junction, Chicago and Northwestern Railway .. | 77.4 | 803 |
| Summit, cutting 4 feet; grade | 79.3 | 840 |
| Stony Creek, water, 783; grade | 80.7 | 820 |
| Mankato | 85.6 | 794 |
| Extreme low and high water of the Minnesota River here, determined by United States engineers | 85.6 | 752- 778 |
| Van Brunt Slough, surface, 766; grade | 86.9 | 792 |
| Crossing the Mankato Branch of the Chicago, Milwaukee and St. Paul Railway | 87.2 | 803 |
| Blue Earth River, ordinary low and high water, 759-777; grade | 87.8 | 798 |
| South Bend | 89.2 | 811 |
| Minneopa Bridge, 68 feet above the water | 90.6 | 866 |
| Minneopa | 90.8 | 874 |
| Summit, grade | 96.8 | 995 |
| Lake Crystal, junction of Blue Earth Branch | 98.5 | 997 |
| Summit, cutting 7 feet; grade | 103.4 | 1012 |
| Iceland | 105.3 | 1001 |
| Madelia | 109.3 | 1024 |
| Watonwan River, low and high water, 982-992; grade .. | 110.8 | 1001 |
| South Fork of Watonwan River, low and high water, 985-994; grade | 111.8 | 1002 |
| Lincoln | 116.7 | 1045 |

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

WESTERN (ST. PAUL AND SIOUX CITY) DIVISION—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. James | 122.0 | 1076 |
| Butterfield | 130.1 | 1187 |
| Mountain Lake Station | 137.0 | 1303 |
| Summit, cutting 6 feet; grade | 140.9 | 1393 |
| Bingham Lake Station | 143.2 | 1423 |
| Summit, cutting 6 feet; grade | 144.3 | 1434 |
| Windom | 147.8 | 1356 |
| Des Moines River, water, 1,334; grade | 148.1 | 1353 |
| Bluff Siding | 149.7 | 1428 |
| Wilder | 154.0 | 1451 |
| Little Des Moines Creek, water, 1,397; grade | 156.5 | 1409 |
| Heron Lake, water, 1,406; grade | 159.0-159.5 | 1408 |
| Heron Lake Station, junction of the Pipestone (or Black Hills) Branch | 160.3 | 1420 |
| Prairie Junction, crossing the Southern Minnesota division of the Chicago, Milwaukee and St. Paul Railway | 164.0 | 1429 |
| Brewster (Hersey) | 170.0 | 1488 |
| Elk Creek, water, 1,476; grade | 171.5 | 1492 |
| Junction of the Burlington, Cedar Rapids and Northern Railway | 177.9 | 1590 |
| Summit, cutting 4 feet; grade | 178.2 | 1591 |
| Worthington | 178.4 | 1585 |
| East Okabena Lake (maximum depth, 15 feet), water, 1,572; grade | 178.6 | 1578 |
| (West Okabena Lake (maximum depth, 25 feet), 1,575; Lake Ocheeda or Ocheyedon (maximum depth, in its northeast part, 20 feet), about 1,565 feet.) | | |
| Sioux Falls Junction, of branch to Sioux Falls and Mitchell | 181.8 | 1637 |
| Summit, cutting 3 feet; grade, highest point on line from St. Paul to Sioux City | 182.3 | 1657 |
| Summit, cutting 5 feet; grade | 184.6 | 1654 |
| Bigelow | 187.8 | 1634 |
| State line; grade | 188.3 | 1647 |
| Summit, cutting 6 feet; grade | 188.9 | 1650 |
| Sibley, near crossing of the Burlington, Cedar Rapids and Northern Railway | 195.9 | 1512 |
| Ashton (St. Gilman) | 202.3 | 1445 |
| Floyd River, bed, 1,377; grade | 210.7 | 1386 |
| Sheldon, near crossing of the Iowa and Dakota division of the Chicago, Milwaukee and St. Paul Railway | 211.9 | 1409 |
| Hospers | 220.0 | 1341 |
| Creek, water, 1,314; grade | 221.3 | 1328 |
| Floyd River, water, 1,280; grade | 228.1 | 1299 |
| Alton (East Orange) | 228.4 | 1305 |
| Floyd River, water, 1,243; grade | 234.9 | 1256 |
| Seney | 239.6 | 1224 |
| Le Mars | 244.2 | 1224 |
| Same, junction with the Illinois Central Railroad | 244.5 | 1230 |
| Floyd River at Le Mars, water | 244.5 | 1200 |

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

BLUE EARTH BRANCH.

This agrees with the corrected profile of the Chicago, Milwaukee and St. Paul Railway at Winnebago City.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Lake Crystal, junction with the Western (St. Paul and Sioux City) division, main line | 98·5 | 997 |
| Watonswan River, low and high-water, 902 919; grade ... | 102·8 | 949 |
| Garden City | 103·5 | 961 |
| Summit, natural surface and grade | 109·0 | 1027 |
| Edgewood (Vernon Centre) | 109·3 | 1022 |
| Blue Earth River, water, 941; grade | 110·3 | 969 |
| Amboy | 114·5 | 1042 |
| Shelbyville | 116·4 | 1055· |
| Summit, natural surface and grade | 116·5 | 1059 |
| Winnebago City | 122·8 | 1095 |
| Crossing the Southern Minnesota division of the Chicago, Milwaukee and St. Paul Railway | 123·1 | 1103 |
| Blue Earth River, water, 1,049; grade | 131·9 | 1072 |
| Blue Earth City | 132·3 | 1083 |
| Coon Creek, water, 1,060; grade | 134·3 | 1082 |
| Elmore | 141·6 | 1125 |
| State line, grade | 142·0 | 1122 |

PIPESTONE (OR BLACK HILLS) BRANCH.

Agreeing exactly or closely with other railways at Pipestone and Flandreau.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Heron Lake Station, junction with the Western division main line | 160·3 | 1420 |
| Dundee | 168·5 | 1446 |
| Lime Creek, bed, 1,450; grade | 174·7 | 1473 |
| Avoca | 180·1 | 1536 |
| Slayton | 186·0 | 1608 |
| Hadley | 191·0 | 1692 |
| Oksida or Beaver Creek, water | 194·6 | 1627 |
| Lake Wilson Station | 196·0 | 1659 |
| Summit, cutting 2 feet; grade | 201·1 | 1851 |
| Summit, cutting 1 foot; grade | 201·9 | 1851 |
| Line of Murray and Pipestone Counties, grade | 202·5 | 1842 |
| Woodstock | 204·3 | 1825 |
| Rock River, water | 208·3 | 1648 |
| Summit, natural surface | 211·5 | 1788 |
| Crossing the Burlington, Cedar Rapids and Northern Railway | 215·1 | 1728 |
| Pipestone | 215·4 | 1723 |
| Big Sioux River at Flandreau, above and below the dam .. | 230·8 | 1523-1514 |
| Prairie, 4 miles farther west | 235·0 | 1675 |

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

SIOUX FALLS AND MITCHELL BRANCH.

Agreeing exactly or closely with connecting railways at Luverne, Sioux Falls, Salem, and Mitchell.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Fect.</i> |
| Sioux Falls Junction, Western division, main line..... | 181·8 | 1637 |
| Summit, cutting 6 feet; grade..... | 184·5 | 1694 |
| Little Rock River, water, 1,632; grade..... | 187·4 | 1652 |
| Rushmore..... | 190·1 | 1668 |
| Adrian..... | 196·9 | 1541 |
| Kanaranzi Creek, water, 1,502; grade..... | 198·0 | 1514 |
| Summit, cutting 5 feet; grade..... | 199·5 | 1572 |
| Magnolia (Drake)..... | 203·8 | 1519 |
| Elk Slough, surface, 1,455; grade..... | 206·2 | 1472 |
| Summit, cutting 15 feet; grade..... | 207·1 | 1518 |
| Warner..... | 208·0 | 1465 |
| Crossing the Burlington, Cedar Rapids and Northern Railway..... | 210·0 | 1440 |
| Rock River, water, 1,426; grade..... | 210·3 | 1440 |
| Luverne, junction of the Rock River Branch..... | 211·1 | 1454 |
| Summit, cutting 5 feet; grade..... | 216·1 | 1546 |
| Beaver Creek Station..... | 219·4 | 1446 |
| Beaver Creek, water, 1,388; grade..... | 219·8 | 1399 |
| State Line, grade..... | 224·4 | 1386 |
| Valley Springs..... | 225·1 | 1395 |
| Split Rock Creek, low and high water, 1,291-1,304; grade..... | 230·6 | 1321 |
| Brandon..... | 232·0 | 1319 |
| Big Sioux River, low and high water, 1,284-1,305; grade..... | 232·4 | 1310 |
| Terrace south of river, natural surface and grade..... | 234·4 | 1366 |
| Sioux Falls..... | 240·3 | 1397 |
| Crossing the Chicago, Milwaukee and St. Paul Railway..... | 240·4 | 1401 |
| Big Sioux River, low and high water, 1,383-1,388; grade..... | 240·5 | 1406 |
| This is above the upper dam, that of the Cascade Mills (Emerson, Sherman & Co.). | | |
| Summit, cutting 10 feet; grade..... | 241·6 | 1474 |
| Big Sioux River, water, 1,406; grade..... | 243·4 | 1420 |
| Skunk Creek, water, 1,452; grade..... | 250·0 | 1468 |
| Hartford..... | 254·4 | 1564 |
| Summit, cutting 3 feet; grade..... | 261·2 | 1695 |
| East Vermilion River, water, 1,458; grade..... | 268·0 | 1472 |
| Montrose..... | 268·3 | 1474 |
| Little Vermilion River, a branch of the East Vermilion River, water, 1,471; grade..... | 269·5 | 1483 |
| Summit, natural surface and grade..... | 275·9 | 1589 |
| Salem, junction with branch of the Dakota division, Chicago and Northwestern Railway..... | 279·5 | 1520 |
| Spencer..... | 289·5 | 1387 |
| Fulton..... | 301·0 | 1332 |
| James River, water..... | 309·0 | 1207 |
| Mitchell..... | 311·8 | 1312 |
| A preliminary survey northwestward from Salem sup- plies the following, which agree with the Chicago, Milwaukee and St. Paul Railway at Forestburg: | | |
| West Vermilion River, water, Sec. 15, T. 103, R. 55..... | 281·0 | 1460 |
| Wolf Creek, water, Sec. 20, T. 104, R. 56..... | 290·6 | 1373 |
| Fawn Lake, water, T. 105, R. 58..... | 303·6 | 1323 |
| Stony Creek, water, Sec. 25, T. 106, R. 60..... | 313·0 | 1256 |
| James River, water, Sec. 12, T. 106, R. 61, near Forestburg.. | 320·2 | 1215 |
| Prairie, 5 miles west of James River..... | 325·0 | 1279 |

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

ROCK RIVER BRANCH.

Agreeing with the Burlington, Cedar Rapids and Northern Railway at Rock Rapids.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Luverne, junction with the Sioux Falls and Mitchell Branch | 211.1 | 1454 |
| Ash Creek Station | 218.7 | 1399 |
| State Line, grade | 221.6 | 1377 |
| Rock Rapids, near crossing of the Burlington, Cedar Rapids and Northern Railway | 226.5 | 1347 |
| Rock River, low and high water | 231.0 | 1299-1314 |
| Doon | 238.9 | 1285 |
| Rock River at the south line of Lyon County, Iowa, low and high water | 240.2 | 1251-1269 |

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY.

[From profiles in the office of H. Fernstrom, engineer, St. Paul.]

ST. PAUL TO DUBUQUE AND CHICAGO.

Referred to sea level by the elevations of the Mississippi River at St. Paul and Dubuque, determined by United States engineers, and of Lake Michigan, determined by the United States Lake Survey, which require a subtraction of 5 to 7 feet, here made, throughout the profile; then agreeing exactly or closely with connecting railways at Empire, Randolph, Dodge Centre, Dubuque Junction, Taopi, New Hampton, and Oelwein.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| St. Paul, union depot | 0.0 | 703 |
| Mississippi River, low and high water, 683-702; grade .. | 0.2- 0.5 | 710 |
| West St. Paul, water tank | 1.0 | 702 |
| Inver Grove | 7.7 | 718 |
| Summit, grade | 13.3 | 902 |
| Rich Valley | 15.8 | 860 |
| Summit, grade | 17.6 | 925 |
| Vermilion River, bed, 836; grade | 22.2 | 850 |
| Empire | 22.6 | 854 |
| Crossing the Hastings and Dakota division of the Chicago, Milwaukee and St. Paul Railway | 22.8 | 858 |
| Little Vermilion River, bed, 849; grade | 23.7 | 877 |
| Hampton (a summit of grade) | 26.7 | 980 |
| Depression, grade | 27.4 | 958 |
| Summit, grade | 28.0 | 980 |
| Randolph, station and crossing the Wisconsin, Minnesota and Pacific (Minneapolis and St. Louis) and Chicago, Milwaukee and St. Paul Railways | 32.8 | 876 |
| Chub Creek, bed, 859; grade | 33.0 | 873 |
| Cannon River, bed, 848; grade | 33.4 | 871 |
| Stanton | 36.4 | 920 |
| Summit, grade | 40.9 | 974 |
| Dennison | 41.4 | 967 |
| Spring Creek, bed, 954; grade | 41.7 | 964 |
| Summit, grade | 46.2 | 1185 |
| Nerstrand | 46.5 | 1182 |
| Depression, grade | 47.5 | 1145 |
| Summit, grade | 49.6 | 1212 |
| North Branch of Zumbro River, bed, 1,070; grade | 52.6 | 1133 |
| Kenyon | 53.0 | 1140 |

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

ST. PAUL TO DUBUQUE AND CHICAGO—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Summit, grade | 55.6 | 1248 |
| Skyberg | 58.1 | 1194 |
| Silver Creek (North Middle Branch of Zumbro River), bed, 1,153; grade | 60.7 | 1176 |
| West Concord | 62.6 | 1232 |
| Summit, grade | 63.8 | 1275 |
| Branch of Zumbro River, bed, 1,224; grade | 65.3 | 1238 |
| Summit, grade | 66.0 | 1271 |
| Eden | 67.2 | 1215 |
| South Middle Branch of Zumbro River, bed, 1,169; grade. Summit, grade | 67.8 | 1181 |
| Creek tributary to the South Middle Branch of Zumbro River, bed, 1,181; grade | 69.6 | 1250 |
| Dodge Centre, station and crossing the Chicago and Northwestern Railway | 70.4 | 1225 |
| Summit, grade | 71.8 | 1292 |
| Hayfield | 79.2 | 1362 |
| Dubuque Junction, branch to Lyle | 81.1 | 1315 |
| Red Cedar River, bed, 1,294; grade | 82.4 | 1318 |
| Sargent | 83.1 | 1308 |
| Summit, grade | 87.5 | 1380 |
| Depression, grade | 89.4 | 1395 |
| Renova | 91.2 | 1357 |
| Crossing the Southern Minnesota division, Chicago, Mil- waukee and St. Paul Railway | 92.7 | 1387 |
| Summit, grade, highest on this line | 93.6 | 1377 |
| Rose Creek, bed, 1,328; grade | 94.3 | 1402 |
| Elkton | 96.6 | 1352 |
| Summit, grade | 98.7 | 1382 |
| Taopi | 104.7 | 1392 |
| Crossing the Iowa and Minnesota division, Chicago, Mil- waukee and St. Paul Railway | 106.3 | 1342 |
| Summit, grade | 106.5 | 1340 |
| Bailey | 108.5 | 1365 |
| Woodman's Creek, bed, 1,240; grade | 113.1 | 1282 |
| Watson Creek, bed, 1,187; grade | 116.0 | 1263 |
| Riceville | 120.6 | 1227 |
| Lowther | 121.0 | 1229 |
| Elma | 125.6 | 1208 |
| Summit, grade | 131.0 | 1182 |
| Elk Creek, bed, 1,144; grade | 132.4 | 1233 |
| Altavista | 134.1 | 1158 |
| Summit, grade | 134.9 | 1155 |
| Devon | 137.0 | 1208 |
| Crossing the Iowa and Dakota division, Chicago, Mil- waukee and St. Paul Railway | 141.2 | 1194 |
| New Hampton | 145.1 | 1158 |
| Boyd | 145.7 | 1150 |
| East Wapsipinicon River, bed, 1,058; grade | 150.0 | 1128 |
| Fredericksburg | 154.0 | 1072 |
| Summit, grade | 154.6 | 1075 |
| Sumner, station and junction of the Waverly Branch | 157.7 | 1138 |
| Creek tributary to the Wapsipinicon River, bed, 1,050; grade | 164.3 | 1060 |
| Summit, grade | 165.3 | 1060 |
| Depression, grade | 167.8 | 1108 |
| Westgate (a summit of grade) | 170.3 | 1053 |
| Otter Creek, bed, 1,030; grade | 172.0 | 1091 |
| Oelwein, station and junction of line to Des Moines, St. Joseph, and Kansas City | 179.6 | 1036 |
| Crossing the Burlington, Cedar Rapids and Northern Railway | 179.7 | 1036 |
| | 180.1 | 1047 |

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

ST. PAUL TO DUBUQUE AND CHICAGO—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Summit, grade | 184.4 | 1143 |
| West Buffalo Creek, bed, 1,091; grade | 185.1 | 1099 |
| Stanley | 185.4 | 1098 |
| Summit, grade | 187.4 | 1144 |
| East Buffalo Creek, bed, 1,080; grade | 188.5 | 1090 |
| Aurora (a summit of grade) | 190.0 | 1135 |
| Lamont | 194.7 | 1045 |
| Summit, grade | 197.7 | 1084 |
| South Fork of Maquoketa River, bed, 970; grade | 199.7 | 995 |
| Dundee | 200.0 | 1001 |
| Mink Creek, bed, 991; grade | 201.8 | 998 |
| Summit, grade | 204.2 | 1058 |
| Thorpe | 204.9 | 1047 |
| Honey Creek, bed, 984; grade | 206.2 | 994 |
| Summit, grade | 209.3 | 1078 |
| Crossing the Chicago, Milwaukee and St. Paul Railway .. | 209.9 | 1051 |
| Oneida | 210.3 | 1045 |
| Almoral | 214.5 | 978 |
| East Branch of Plum Creek, bed, 957; grade | 215.8 | 969 |
| Summit, grade | 218.0 | 1040 |
| North Fork of Maquoketa River, bed, 929; grade | 222.6 | 945 |
| Dyersville | 222.9 | 945 |
| Summit, grade | 228.5 | 1090 |
| Farley | 229.1 | 1068 |
| Kidder | 233.3 | 860 |
| Graf | 237.4 | 768 |
| Durango | 245.4 | 643 |
| Dubuque, station and crossing the Chicago, Milwaukee and St. Paul Railway | 253.2 | 611 |
| Mississippi River, extreme low water (1864), 584.75; ex- treme high water (1880), 606.65; grade | 253.7-254.0 | 622 |
| Menominee | 262.0 | 610 |
| Portage Curve | 267.2 | 608 |
| Galena Junction | 267.9 | 612 |
| Aiken | 269.0 | 611 |
| Tunnel $\frac{1}{2}$ mile long, natural surface above, 1,008; sum- mit grade, at east end of tunnel | 272.7-273.2 | 800 |
| Tunnel Siding | 274.0 | 763 |
| Trousdale | 278.8 | 638 |
| Apple River, bed, 614; grade | 279.0 | 640 |
| Elizabeth | 282.0 | 785 |
| Summit, grade | 284.7 | 891 |
| Depression, grade | 285.8 | 845 |
| Woodbine | 286.9 | 870 |
| Summit, grade | 289.4 | 906 |
| Rush Creek, bed, 788; grade | 290.8 | 832 |
| Stockton (a summit of grade, highest between the Missis- sippi and Lake Michigan) | 294.3 | 1002 |
| Kent | 300.6 | 898 |
| Yellow Creek Station | 305.6 | 826 |
| Ellis | 311.0 | 821 |
| Summit, grade | 314.7 | 838 |
| Crossing, 20 feet above the Chicago, Milwaukee and St. Paul Railway | 316.0 | 800 |
| Crossing, 20 feet above the Illinois Central Railroad | 318.0 | 865 |
| Dunbar | 318.6 | 853 |
| German Valley | 324.5 | 810 |
| Summit, grade | 326.0 | 864 |
| Melton | 331.5 | 769 |
| Crossing the Chicago, Milwaukee and St. Paul Railway .. | 337.0 | 724 |
| Byron | 337.4 | 724 |
| Walnut Creek, bed, 647; grade | 340.0 | 698 |
| Stillman Valley | 341.9 | 721 |

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

ST. PAUL TO DUBUQUE AND CHICAGO—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Summit, grade | 346.0 | 856 |
| Holcomb | 346.7 | 830 |
| Crossing the Chicago, Burlington and Quincy Railway .. | 347.0 | 826 |
| Lindenwood | 350.3 | 774 |
| Killbuck Creek, bed, 747; grade | 351.0 | 760 |
| Esmond | 355.7 | 822 |
| Summit, grade | 358.0 | 897 |
| Depression, grade | 359.5 | 840 |
| Clare | 361.4 | 871 |
| Summit, grade | 363.7 | 890 |
| Kishwaukee River, bed, 815; grade | 366.8 | 824 |
| Crossing the Chicago and Northwestern Railway | 368.6 | 846 |
| Sycamore | 368.8 | 842 |
| Richardson (a summit of grade) | 374.0 | 884 |
| Summit, grade | 379.7 | 924 |
| Lily Lake Station | 379.9 | 919 |
| Wasco | 383.9 | 825 |
| Fox River, bed, 676; grade | 389.0 | 726 |
| St. Charles | 389.5 | 728 |
| Crossing, 20 feet above the Chicago and Northwestern Railway | 393.5 | 780 |
| Ingaltou | 394.6 | 776 |
| Du Page River, bed, 715; grade | 396.1 | 730 |
| Gretna | 399.6 | 783 |
| Summit, grade | 400.0 | 788 |
| Depression, grade | 403.6 | 695 |
| Lombard | 404.7 | 721 |
| Crossing, 20 feet above the Chicago and Northwestern Railway | 405.1 | 732 |
| Salt Creek, bed, 655; grade | 407.4 | 670 |
| South Elmhurst | 408.5 | 678 |
| Summit, grade | 409.4 | 696 |
| Maywood | 413.7 | 630 |
| Des Plaines River, bed, 600; grade | 414.4 | 622 |
| Crossing the C., H. and R. Railroad | 414.7 | 626 |
| Forest Home | 414.9 | 624 |
| Crossing the Belt Line Railway | 418.8 | 606 |
| Crossing the Chicago, Burlington and Quincy Railway .. | 419.6 | 602 |
| Crossing the Chicago and Northwestern Railway and the C., St. L. and P. Railroad | 421.4 | 591 |
| Chicago, Polk Street Depot | 425.0 | 586 |
| (Lake Michigan, February, 1888, 580; mean during the years 1860 to 1888, 581 feet.) | | |

HAYFIELD TO LYLE.

Agreeing with connecting railways at Austin and Lyle.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Hayfield | 81.1 | 1315 |
| Dubuque Junction, of line to Dubuque and Chicago | 82.4 | 1318 |
| Red Cedar River, bed, 1,286; grade | 83.0 | 1298 |
| Summit, grade | 84.5 | 1342 |
| Waltham | 85.9 | 1325 |
| Red Rock | 90.7 | 1256 |
| Roberts Creek, bed, 1,219; grade | 91.4 | 1243 |
| Summit, grade | 92.2 | 1262 |

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

HAYFIELD TO LYLE—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Crossing the Southern Minnesota division, Chicago, Milwaukee and St. Paul Railway..... | 93.9 | 1230 |
| Crossing the Iowa and Minnesota division, Chicago, Milwaukee and St. Paul Railway..... | 96.7 | 1213 |
| Red Cedar River, bed, 1,178; grade..... | 97.3 | 1199 |
| Austin..... | 97.7 | 1197 |
| Red Cedar River, bed, 1,169; grade..... | 98.2 | 1197 |
| Rose Creek, bed, 1,167; water, 1,171; grade..... | 101.7 | 1191 |
| Summit, grade..... | 103.2 | 1217 |
| Varco..... | 103.9 | 1205 |
| Summit, grade..... | 105.4 | 1214 |
| Depression, grade..... | 107.9 | 1192 |
| Summit, grade..... | 108.9 | 1204 |
| Lyle..... | 109.1 | 1202 |
| Crossing the Austin and Mason City line of the Chicago, Milwaukee and St. Paul Railway and junction with the Central Iowa Railway..... | 109.2 | 1200 |

OELWEIN TO ST. JOSEPH.

To accord with the profile from St. Louis to Chicago, this receives here a uniform subtraction of 6 feet. It then gives the elevation of low water in the Missouri River at St. Joseph 4 feet higher than its determination by the Missouri River Commission, which latter is doubtless very nearly correct.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Oelwein, junction with line to Dubuque and Chicago... | 179.7 | 1036 |
| Summit, grade..... | 183.7 | 1068 |
| Fairbank..... | 186.8 | 1000 |
| Little Wapsipinicon River, bed, 952; grade..... | 187.6 | 971 |
| Summit, grade..... | 188.3 | 1002 |
| Buck Creek, bed, 947; grade..... | 189.3 | 961 |
| Summit, grade..... | 190.6 | 999 |
| Wapsipinicon River, bed, 924; grade..... | 191.8 | 944 |
| Dunkerton..... | 194.8 | 945 |
| Summit, grade..... | 195.9 | 993 |
| Dewar..... | 199.4 | 889 |
| Crossing, 20 feet above the Illinois Central Railroad..... | 204.9 | 870 |
| East Waterloo..... | 205.4 | 843 |
| Red Cedar River, bed, 827; grade..... | 205.6 | 846 |
| Crossing the Burlington, Cedar Rapids and Northern Railway..... | 206.0 | 843 |
| West Waterloo..... | 206.7 | 845 |
| Wilson's Junction..... | 211.8 | 870 |
| Hudson..... | 214.9 | 883 |
| Reinbeck..... | 224.3 | 923 |
| Crossing the Burlington, Cedar Rapids and Northern Railway..... | 224.5 | 926 |
| Berlin (a summit of grade)..... | 231.4 | 1056 |
| Four Mile Creek, bed, 997; grade..... | 232.9 | 1008 |
| Summit, grade..... | 233.8 | 1050 |
| Wolf Creek, bed, 925; grade..... | 236.8 | 948 |
| Crossing the Chicago and Northwestern Railway..... | 236.9 | 948 |
| Gladbrook..... | 237.0 | 949 |
| Summit, grade..... | 242.1 | 1047 |
| Green Mountain Station..... | 245.8 | 994 |
| Rockton..... | 248.8 | 851 |

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

OELWEIN TO ST. JOSEPH—Continued.

| | From St. Paul. | Above the sea. |
|--|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Iowa River, bed, 845; grade..... | 250.2 | 860 |
| Crossing the Chicago and Northwestern Railway..... | 253.1 | 872 |
| Marshalltown (a summit of grade)..... | 253.7 | 895 |
| Crossing the Chicago and Northwestern and the Central Iowa Railways..... | 254.1 | 887 |
| Summit, grade..... | 258.6 | 1000 |
| Luray (a depression of grade)..... | 260.0 | 934 |
| Timber Creek, bed, 933; grade..... | 261.6 | 948 |
| Summit, grade..... | 264.6 | 1055 |
| Crossing the Central Iowa Railway, State Centre Branch. Crossing, 20 feet above the Chicago, Milwaukee and St. Paul Railway..... | 265.2 | 1047 |
| Melbourne..... | 266.5 | 1054 |
| North Skunk River, at water tank, bed, 887; grade..... | 266.9 | 1010 |
| Summit, grade..... | 272.7 | 907 |
| Baxter..... | 275.1 | 1009 |
| Ira..... | 276.0 | 998 |
| Depression, grade..... | 280.8 | 826 |
| Indian Creek, bed, 796; grade..... | 283.1 | 806 |
| Mingo..... | 284.5 | 813 |
| Summit, grade..... | 285.1 | 819 |
| Valaria..... | 287.8 | 936 |
| Skunk River, at water tank, bed, 785; grade..... | 290.0 | 848 |
| Santiago..... | 291.4 | 802 |
| Summit, grade..... | 293.0 | 832 |
| Bondurant..... | 297.0 | 970 |
| Berwick (depression of grade at Four Mile Creek)..... | 297.8 | 963 |
| Summit, grade..... | 303.0 | 845 |
| Redhead..... | 305.1 | 934 |
| Crossing the Chicago, Rock Island and Pacific, the Wa- bash, St. Louis and Pacific, and the Chicago, Burling- ton and Quincy Railways..... | 309.1 | 805 |
| Des Moines River, bed, 769; grade..... | 310.1 | 787 |
| Crossing the Des Moines, Osceola and Southern Railroad. South Des Moines..... | 311.0 | 795 |
| Millman..... | 312.2 | 794 |
| Pleasant Ridge Station..... | 312.4 | 795 |
| Summit, grade..... | 316.0 | 830 |
| Badger Creek, bed, 806; grade..... | 320.3 | 965 |
| Lida..... | 322.8 | 977 |
| Summit, grade..... | 326.2 | 828 |
| Crossing the Chicago, Rock Island and Pacific Railway.. | 327.2 | 848 |
| Middle River, bed, 810; grade..... | 330.0 | 947 |
| Sylvan..... | 331.9 | 856 |
| Hanley..... | 332.4 | 840 |
| Peru..... | 333.4 | 842 |
| Barney..... | 337.7 | 883 |
| Lorimor..... | 346.4 | 939 |
| Summit, grade..... | 353.4 | 1047 |
| Monette..... | 357.9 | 1224 |
| Grand River, bed, 1,027; grade..... | 359.8 | 1232 |
| Talmage..... | 361.1 | 1227 |
| Crossing, about 30 feet above the Chicago, Burlington and Quincy Railway..... | 365.0 | 1059 |
| Afton Junction (a summit of grade)..... | 365.5 | 1072 |
| Twelve Mile Creek, bed, 1,051; grade..... | 366.3 | 1078 |
| Arispe (a summit of grade, highest on this line)..... | 368.4 | 1162 |
| Shannon City..... | 370.0 | 1115 |
| Knowlton..... | 373.6 | 1268 |
| Crossing the H. and S. Railroad..... | 378.1 | 1139 |
| Benton..... | 384.7 | 1093 |
| Squirrel Creek, bed, 1,022; grade..... | 385.6 | 1086 |
| | 393.9 | 1051 |
| | 394.2 | 1050 |

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

OELWEIN TO ST. JOSEPH—Continued.

| | From St. Paul. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Maloy (a summit of grade)..... | 397.3 | 1116 |
| Blockton..... | 403.0 | 1074 |
| Line between Iowa and Missouri, grade..... | 407.6 | 1061 |
| Iona..... | 407.9 | 1063 |
| Sheridan..... | 413.3 | 1037 |
| Parnell City..... | 418.8 | 1023 |
| Summit, grade..... | 419.7 | 1053 |
| Platte River, bed, 968; grade..... | 424.2 | 997 |
| Ravenwood..... | 425.5 | 1015 |
| Conception..... | 430.8 | 982 |
| Crossing, about 20 feet beneath the Wabash, St. Louis and Pacific Railway..... | 431.4 | 972 |
| Guilford..... | 439.0 | 941 |
| Depression, grade..... | 442.0 | 922 |
| Cawood..... | 442.8 | 935 |
| Rea..... | 446.6 | 1064 |
| Summit, grade..... | 446.8 | 1068 |
| One Hundred and Two Mile River, bed, 874; grade..... | 450.7 | 904 |
| Depression, grade..... | 451.0 | 900 |
| Summit, grade..... | 455.8 | 1090 |
| Savannah..... | 456.1 | 1085 |
| Dean (a depression of grade)..... | 461.3 | 882 |
| Summit, grade..... | 463.7 | 985 |
| Junction with the Kansas City, St. Joseph and Council Bluffs Railway..... | 468.8 | 820 |
| St. Joseph..... | 469.0 | 820 |
| Missouri River at St. Joseph, low water and zero of the Signal Service gauge on the pivot pier of the St. Joseph and Grand Island bridge..... | 469.0 | 794 |
| Same, extreme low water, determined by the Missouri River Commission..... | 469.0 | 790 |

MINNEAPOLIS AND ST. LOUIS RAILWAY.

[From profiles in the office of Robert Angst, engineer, Minneapolis.]

MAIN LINE.

This agrees with connecting railways at Chaska, Merriam Junction, Waterville, Waseca, Albert Lea, Madison, Britt, Livermore, and Fort Dodge.

| | From Minne- apolis, | Above the sea. |
|---|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Minneapolis, union depot..... | 0.7 | 810 |
| Same, depot of this railway, Third street and Fourth avenue northwest..... | 0.0 | 826 |
| Cedar Lake, low and high water, 857-862; grade..... | 3.0 | 865 |
| Bass Lake, water, 878; grade..... | 4.5 | 886 |
| Summit, cutting 12 feet; grade..... | 5.5 | 918 |
| Marsh, surface, 890; grade..... | 7.5 | 895 |
| Minnehaha Creek, water, 895; grade..... | 7.8 | 907 |
| Summit, cutting 14 feet; grade..... | 8.2 | 928 |
| Hopkins, junction of the Pacific division..... | 8.7 | 921 |
| Cut, 18 feet deep; grade..... | 9.5 | 911 |
| Shady Oak Lake, low and high water, 905-908; grade.... | 10.6 | 910 |
| Mud Lake, water, 900; grade..... | 11.1 | 903 |
| Summit, cutting 8 feet; grade..... | 11.3 | 923 |
| Glen Lake, surface of marsh, 905; grade..... | 11.5 | 908 |

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

MAIN LINE—Continued.

| | From Minne- apolis. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Summit, cutting 18 feet; grade..... | 11·6 | 918 |
| Island Lake, water, 892; grade..... | 12·7 | 904 |
| Summit, natural surface and grade..... | 12·9 | 914 |
| Purgatory Creek, bed, 831; grade..... | 14·1 | 855 |
| Eden Prairie..... | 15·2 | 884 |
| Summit, cutting 8 feet; grade..... | 16·5 | 902 |
| Bradford Lake, water, 866; grade..... | 18·0 | 874 |
| Summit Station; cut 30 feet deep, on the line between Hennepin and Carver Counties, grade..... | 18·7 | 876 |
| Ravine, bottom, 772; grade..... | 19·1 | 847 |
| Same, bottom, 738; grade..... | 20·1 | 803 |
| Foot of the Minnesota River bluff, grade..... | 22·0 | 754 |
| Chaska, crossing the Hastings and Dakota division of the Chicago, Milwaukee and St. Paul Railway..... | 22·7 | 728 |
| Carver..... | 24·7 | 722 |
| Minnesota River, low water, 690; grade..... | 24·9 | 728 |
| Merriam Junction, crossing the St. Paul and Sioux City division of the Chicago, St. Paul, Minneapolis and Omaha Railway..... | 27·2 | 755 |
| Jordan..... | 32·3 | 755 |
| Sand Creek: | | |
| Water, 753; grade..... | 32·7 | 768 |
| Water, 762; grade..... | 32·9 | 777 |
| Water, 780; grade..... | 33·2 | 788 |
| Water, 802; grade..... | 33·8 | 810 |
| Water, 821; grade..... | 34·5 | 831 |
| Helena..... | 36·3 | 888 |
| Sand Creek, water, 864; grade..... | 36·6 | 874 |
| Raven Stream, water, 868; grade..... | 36·8 | 883 |
| New Prague..... | 42·6 | 975 |
| Montgomery..... | 50·0 | 1065 |
| Mulford's Siding..... | 54·6 | 1062 |
| Crossing the town-line road between Montgomery and Kilkenny..... | 54·9 | 1058 |
| Lake Dora, high water, 1,042; grade..... | 55·8 | 1046 |
| Cannon River, water, 1,040; grade..... | 56·9 | 1047 |
| Kilkenny..... | 58·6 | 1058 |
| Little Cannon River, water, 1,021; grade..... | 59·1 | 1039 |
| Summit, highest natural surface on this line, 1,091; grade..... | 62·3 | 1072 |
| Summit, highest grade..... | 63·0 | 1082 |
| Cannon River, low water, 996; grade..... | 65·0 | 1006 |
| Lakes Tetonka and Sakata, low and high water..... | 65·0 | 996-1002 |
| Waterville, junction of the Wisconsin, Minnesota and Pacific Railway..... | 65·4 | 1010 |
| Crossing road on line of Le Sueur and Waseca Counties.. | 67·0 | 1051 |
| Palmer Siding (Iosco)..... | 69·7 | 1148 |
| Summit, cutting 14 feet; grade..... | 70·3 | 1156 |
| Loon Lake, water, 1,136; grade..... | 75·7 | 1140 |
| Crossing the Winona and St. Peter division of the Chi- cago and Northwestern Railway..... | 76·0 | 1156 |
| Waseca..... | 76·2 | 1153 |
| Creek in Sec. 8, Otisco, water, 1,078; grade..... | 81·2 | 1084 |
| Otisco..... | 83·2 | 1148 |
| Le Sueur River, water, 1,117; grade..... | 84·8 | 1130 |
| New Richland..... | 88·7 | 1180 |
| Hartland..... | 94·9 | 1251 |
| Summit and highway crossing, grade..... | 99·1 | 1320 |
| Manchester..... | 100·9 | 1264 |
| Summit, grade..... | 106·4 | 1240 |
| Albert Lea, junction with the Burlington, Cedar Rapids and Northern Railway..... | 108·0 | 1230 |

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

MAIN LINE—Continued.

| | From Minne- apolis. | Above the sea. |
|---|------------------------|----------------|
| | Miles. | Feet. |
| Crossing the Southern Minnesota division of the Chicago, Milwaukee and St. Paul Railway | 108.1 | 1228 |
| Pickereil Lake, water, 1,241; grade | 110.3 | 1257 |
| Summit, grade | 111.6 | 1290 |
| Twin Lakes Station, water, 1,245; grade | 115.0 | 1261 |
| Creek at the State line, water, 1,268; grade | 120.9 | 1274 |
| Norman | 121.4 | 1285 |
| Summit, grade | 122.9 | 1323 |
| Lake Mills | 127.2 | 1270 |
| Summit, grade | 128.3 | 1279 |
| Lime Creek, water, 1,218; grade | 130.4 | 1228 |
| Pike Creek, water, 1,216; grade | 133.6 | 1224 |
| Leland (Benson's Grove) | 136.0 | 1222 |
| Forest City | 141.7 | 1226 |
| Summit, grade | 142.5 | 1236 |
| Madison, junction with branch of the Burlington, Cedar Rapids and Northern Railway | 146.8 | 1214 |
| Marsh, grade | 149.4 | 1220 |
| Summit, grade | 151.4 | 1235 |
| Iowa River, water, 1,208; grade | 152.8 | 1217 |
| Summit, grade | 154.2 | 1247 |
| Depression, crossing the Iowa and Dakota division of the Chicago, Milwaukee and St. Paul Railway | 155.5 | 1213 |
| Britt (a summit of grade) | 156.3 | 1236 |
| Depression, grade | 159.3 | 1191 |
| Summit, grade | 161.3 | 1222 |
| Boone River, water, 1,159; grade | 166.7 | 1163 |
| Corwith (a summit of grade) | 167.5 | 1186 |
| Prairie Creek, water, 1,128; grade | 174.7 | 1142 |
| Summit, grade | 175.9 | 1175 |
| Depression, grade | 176.5 | 1158 |
| Summit, grade | 177.5 | 1176 |
| East Fork of Des Moines River, water, 1,081; grade | 180.5 | 1106 |
| Livermore | 181.6 | 1141 |
| Summit, grade | 183.1 | 1151 |
| Bloody Run, water, 1,100; grade | 183.8 | 1124 |
| Summit, grade | 187.4 | 1158 |
| Humboldt | 192.0 | 1095 |
| East Fork of Des Moines River, water, 1,047; grade | 195.6 | 1071 |
| Beaver Creek, water, 1,096; grade | 197.5 | 1120 |
| Summit, grade | 198.3 | 1152 |
| Badger Creek, water, 1,129; grade | 200.6 | 1136 |
| Summit, grade | 201.4 | 1162 |
| Soldier Creek, water, 1,118; grade | 205.0 | 1128 |
| Summit, grade | 206.2 | 1148 |
| Fort Dodge, upper depot | 209.3 | 1126 |
| Junction with the Iowa division of the Illinois Central Railroad | 210.9 | 1126 |
| The following are from Gannett's Dictionary of Alti- tudes: | | |
| Fort Dodge, passenger station of the Illinois Central Railroad | | 1032 |
| Same, of the Minneapolis and St. Louis and Des Moines and Fort Dodge Railroads | | 1015 |
| Low water of the Des Moines River here is approxi- mately | | 1000 |

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

WISCONSIN, MINNESOTA AND PACIFIC RAILWAY, RED WING TO WATERVILLE AND MANKATO.

(Operated by the Minneapolis and St. Louis Railway Company.)

This agrees with connecting railways at Randolph, Northfield, Faribault, Waterville, and Mankato.

| | From Red Wing. | Above the sea. |
|---|----------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Red Wing | 0·0 | 708 |
| Crossing Main street, Red Wing | 0·2 | 711 |
| Hay Creek, bed, 671; grade | 1·1 | 693 |
| Spring Creek, bed, 672; grade | 2·7 | 692 |
| Belle Creek, bed, 698; grade | 9·4 | 709 |
| Belle Creek Station | 10·1 | 709 |
| Cannon Falls | 20·7 | 816 |
| Cannon River, water in pond above the lower dam, Cannon Falls, 783; grade | 21·0 | 812 |
| Line of Goodhue and Dakota Counties, grade | 22·2 | 843 |
| Crossing the Chicago, St. Paul and Kansas City Railway | 26·9 | 876 |
| Chub Creek, low and high water, 864-869; grade | 27·3 | 876 |
| Cascade (Granville) | 28·1 | 895 |
| Waterford | 33·8 | 905 |
| Line of Dakota and Rice Counties, grade | 34·8 | 899 |
| Crossing the Cannon Falls line of the Chicago, Milwaukee and St. Paul Railway | 35·3 | 912 |
| Northfield | 35·9 | 912 |
| Cannon River, ordinary stage of water above the Northfield dam, 902; high water | | 908 |
| Dundas | 38·8 | 928 |
| Wolf Creek, water, 927; grade | 40·2 | 944 |
| Cannon River, low and high water, 956-962; grade | 48·5 | 968 |
| Faribault | 49·0 | 973 |
| Crossing the Iowa and Minnesota division of the Chicago, Milwaukee and St. Paul Railway | 49·5 | 983 |
| Fair Ground | 50·2 | 978 |
| Junction of spur track to the Polar Star Mill | 50·5 | 981 |
| Warsaw | 56·5 | 1009 |
| Cannon River, water, 977; grade | 57·4 | 986 |
| Morristown | 59·5 | 1010 |
| Cannon River, low and high water, 996-1,002; grade | 59·8 | 1010 |
| Summit, cutting 11 feet; grade | 62·0 | 1058 |
| Line of Rice and Le Sueur Counties, grade | 63·3 | 1032 |
| Waterville, junction with the Minneapolis and St. Louis Railway, main line | 65·8 | 1010 |
| Elysian | 71·7 | 1049 |
| Madison Lake Station | 78·7 | 1049 |
| Eagle Lake Station | 83·9 | 1011 |
| Mankato | 93·5 | 778 |

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

PACIFIC DIVISION.

(The portion from Hopkins to Morton is owned by the Minneapolis and St. Louis Railway Company; and the portion thence westward is operated by this company under a lease from the Wisconsin, Minnesota and Pacific Railway Company.)

The profile agrees with connecting railways at Excelsior, Norwood, Hanley Falls, and Watertown.

| | From Minne- apolis. | Above the sea. |
|---|------------------------|----------------|
| | Miles. | Feet. |
| Hopkins, junction with the main line | 8.7 | 921 |
| Minnetonka Mills | 11.7 | 936 |
| Tamarack Marsh, bottom of mud, 880; grade | 14.5 | 909 |
| Hotel, St. Louis depot | 15.8 | 943 |
| Lake Minnetonka, Carson's Bay, water, 928, 18 feet deep; grade | 16.0 | 933 |
| Solberg point, grade on drawbridge and at crossing of the Hutchinson Branch of the St. Paul, Minneapolis and Manitoba Railway | 17.9 | 938 |
| Excelsior | 18.9 | 947 |
| Park Junction | 20.3 | 938 |
| Victoria | 24.8 | 965 |
| Windmill and tank | 30.1 | 966 |
| Waconia | 31.5 | 986 |
| Marsh, surface, 978-980; grade | 34.0-34.7 | 981 |
| Young America | 39.1 | 993 |
| Crossing the Hastings and Dakota division of the Chi- cago, Milwaukee and St. Paul Railway | 40.2 | 976 |
| Norwood | 40.3 | 977 |
| Hamburg | 43.8 | 1000 |
| Line of Carver and Sibley Counties, grade | 45.0 | 995 |
| Green Isle | 48.1 | 1001 |
| Arlington creek, water, 968; grade | 53.7 | 984 |
| Arlington | 54.3 | 995 |
| Rush River, outlet of Titlow Lake, water, 981; grade | 59.7 | 986 |
| Gaylord | 62.3 | 993 |
| Winthrop | 69.3 | 1016 |
| Rush River, water, 1,023; grade | 73.5 | 1030 |
| Gibbon | 77.4 | 1046 |
| Line of Sibley and Renville Counties, grade | 82.2 | 1046 |
| Mud Creek, bed, 1,022; grade | 84.2 | 1038 |
| Fairfax | 86.9 | 1041 |
| Fort Creek, water, 1,013; grade | 89.5 | 1020 |
| Three Mile Creek, water, 1,015; grade | 90.2 | 1024 |
| Franklin | 94.9 | 1005 |
| Purgatory Creek, bed, 966; grade | 95.4 | 997 |
| Johnson's Creek, bed, 941; grade | 95.8 | 983 |
| Thompson's Creek, bed, 871; grade | 96.5 | 938 |
| Campbell's Creek, bed, 868; grade | 97.0 | 913 |
| Birch Cooley, bed, 827; water, 832; grade | 98.7 | 837 |
| Morton | 100.4 | 841 |
| Minnesota River, bed, 805; ordinary low water, 814; high water (1881), 836; grade | 100.7 | 842 |
| North Redwood | 106.2 | 855 |
| Redwood River, bed, 826; water, ordinary stage, 831; grade | 106.7 | 859 |
| Top of river bluff, natural surface and grade | 110.4 | 1028 |
| Delhi | 112.8 | 1022 |
| Summit, cutting 3 feet; grade | 121.9 | 1087 |
| Echo | 122.9 | 1080 |
| Wood Lake Station | 129.2 | 1059 |
| Hanley Falls, near crossing of the Willmar and Sioux Falls (St. Paul, Minneapolis and Manitoba) Railway .. | 134.3 | 1047 |
| Yellow Medicine River, bed, 1,011; water, ordinary stage, 1,017; high water, 1,032; grade | 134.7 | 1042 |

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

PACIFIC DIVISION—Continued.

| | From Minne- apolis. | Above the sea. |
|--|------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Hazel Run Station..... | 140·6 | 1057 |
| Clarksfield..... | 145·7 | 1084 |
| Outlet of Muddy Lake, water, 1,046; grade..... | 148·8 | 1054 |
| Boyd..... | 152·2 | 1050 |
| East Branch of Lac Qui Parle River, bed, 1,028; high water, 1,037; grade..... | 160·4 | 1052 |
| West Branch of Lac Qui Parle River, bed, 1,029; high water, 1,047; grade..... | 161·3 | 1054 |
| Dawson..... | 161·5 | 1054 |
| Madison..... | 170·4 | 1095 |
| Marietta..... | 181·5 | 1128 |
| West line of Minnesota; grade..... | 183·1 | 1146 |
| Revillo..... | 189·0 | 1208 |
| South Fork of Yellow Bank River, trestle bridge, 56 feet high, grade..... | 192·0 | 1340 |
| Wilson..... | 192·6 | 1366 |
| Trestle bridge, 61 feet high; grade..... | 196·9 | 1551 |
| Lone Tree Lake, water, 1,880; grade..... | 203·7 | 1882 |
| Troy..... | 205·5 | 1885 |
| Summit, cutting 2 feet; grade..... | 209·5 | 1995 |
| Waverly..... | 211·9 | 1992 |
| Summit of the Coteau des Prairies, natural surface and grade..... | 212·7 | 2000 |
| Watertown, junction with the Burlington, Cedar Rapids and Northern Railway..... | 222·1 | 1738 |
| Same, passenger station (with Burlington, Cedar Rapids and Northern Railway)..... | 222·3 | 1734 |

BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY.

[From H. F. White, engineer, Cedar Rapids.]

The notes of this entire railway system, as received from Mr. White, are found to require a subtraction of 20 feet, which is here made uniformly throughout its several divisions and branches, excepting at Plymouth Junction and thence to Albert Lea, where the subtraction required and here made is 18 feet.

BURLINGTON TO ALBERT LEA.

Referred to sea level by the elevation of the Mississippi River at Burlington, determined by United States engineers, and agreeing with connecting railways and other branches of this system at Linn Junction, Vinton, Plymouth Junction, and Albert Lea.

| | From Burling- ton. | Above the sea. |
|---|-----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Burlington, extreme low and high water of the Missis- sippi River..... | 0·0 | 510·77-531 |
| Burlington, union depot..... | 0·0 | 533 |
| Latty..... | 8·7 | 733 |
| Sperry..... | 11·6 | 757 |
| Mediapolis..... | 15·3 | 779 |
| Linton..... | 19·9 | 771 |
| Morning Sun..... | 22·7 | 745 |
| Wapello..... | 29·3 | 588 |
| Bard..... | 35·2 | 599 |
| Columbus Junction..... | 40·6 | 595 |
| Iowa River, water..... | 41·2 | 578 |

LINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY—Continued.

BURLINGTON TO ALBERT LEA—Continued.

| | From Burling- ton. | Above the sea. |
|--|-----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| en | 44·6 | 612 |
| ..... | 47·6 | 618 |
| ..... | 55·0 | 638 |
| Liberty | 61·7 | 673 |
| dale | 67·1 | 725 |
| ranch Station | 69·8 | 718 |
| ..... | 73·3 | 800 |
| ..... | 74·8 | 751 |
| ..... | 77·5 | 763 |
| t, grade | 79·3 | 862 |
| ..... | 82·3 | 794 |
| ..... | 89·4 | 741 |
| dar River, water | 96·5 | 705 |
| Rapids | 98·1 | 732 |
| unction, of the Decorah Branch | 102·3 | 756 |
| dar River, water | 103·0 | 728 |
| ..... | 108·0 | 751 |
| urg | 112·0 | 774 |
| , junction of the Watertown line | 121·0 | 810 |
| Auburn | 128·9 | 863 |
| te | 135·1 | 812 |
| urn | 143·3 | 827 |
| oo | 150·6 | 841 |
| Falls | 156·4 | 854 |
| ..... | 159·8 | 864 |
| w | 164·7 | 884 |
| ck | 172·0 | 921 |
| ville | 179·0 | 924 |
| ..... | 190·0 | 924 |
| Rock | 195·7 | 1002 |
| rd | 203·7 | 1021 |
| unction, Iowa and Dakota division of the Chicago, auke and St. Paul Railway | 210·0 | 1062 |
| 'alls | 216·6 | 1104 |
| 1th Junction, Austin and Mason City line of the ago, Milwaukee and St. Paul Railway | 219·7 | 1126 |
| Junction | 225·0 | 1201 |
| ood | 236·0 | 1222 |
| ine Station | 238·7 | 1232 |
| lle | 245·7 | 1235 |
| Lea, junction with the Minneapolis and St. Louis way | 252·7 | 1230 |
| Albert Lea, water | 252·7 | 1209 |

DECORAH BRANCH.

eing at Oelwein with the Chicago, St. Paul and Kansas City Railway, and at
lle and Decorah with the Chicago, Milwaukee and St. Paul Railway.

| | From Cedar Rapids. | Above the sea. |
|--|-----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| unction, 102·3 miles from Burlington | 4·2 | 756 |
| ille | 10·1 | 780 |
| Point | 18·0 | 819 |
| r | 24·7 | 890 |
| y | 31·3 | 990 |
| ndence | 39·1 | 921 |
| pinicon River, water | 41·0 | 958 |

BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY—Continued.

DECORAH BRANCH—Continued.

| | From Cedar Rapids. | Above the sea. |
|---|--------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Hazleton | 49.3 | 998 |
| Crossing the Chicago, St. Paul and Kansas City Railway .. | 53.0 | 1047 |
| Oelwein | 53.4 | 1049 |
| Maynard | 60.3 | 1106 |
| Randalia | 66.5 | 1106 |
| Summit, grade | 71.3 | 1211 |
| West Union | 74.6 | 1115 |
| Brainard | 81.2 | 919 |
| Elgin | 85.3 | 843 |
| Turkey River, water | 86.0 | 811 |
| Clermont | 88.6 | 866 |
| Postville Junction | 94.9 | 1062 |
| Postville, on branch $3\frac{1}{2}$ miles from last | 98.4 | 1192 |
| Castalia | 98.7 | 1240 |
| Ossian | 104.0 | 1271 |
| Nordness | 111.0 | 1035 |
| Crow Creek, water | 116.5 | 846 |
| Decorah | 118.2 | 863 |

VINTON TO WATERTOWN.

Agreeing exactly or closely with connecting railways and branches of this system at Dow's, Livernore, Emmetsburg, Lake Park, Sibley, Luverne, Pipestone, Elkton, and Watertown.

| | From Cedar Rapids. | Above the sea. |
|--|--------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Vinton, junction with the Albert Lea line, 121.0 miles from Burlington | 22.9 | 810 |
| Garrison | 29.9 | 869 |
| Dysart | 38.9 | 968 |
| Traer | 47.2 | 916 |
| Reinbeck | 59.3 | 926 |
| Morrison | 63.3 | 947 |
| Grundy Centre | 68.7 | 976 |
| Holland | 71.3 | 996 |
| Wells | 75.4 | 1058 |
| Cleves | 84.9 | 1070 |
| Abbott | 86.8 | 1099 |
| Robertson | 89.9 | 1175 |
| Iowa Falls | 96.9 | 1107 |
| Carleton | 107.3 | 1150 |
| Iowa River, low and high water, 1,126-1,136; grade | 112.5 | 1138 |
| Dow's Station, junction of the Madison Branch | 112.9 | 1142 |
| Galtville | 119.1 | 1198 |
| Clarion | 126.5 | 1168 |
| Goldfield | 136.0 | 1108 |
| Hardy | 144.3 | 1129 |
| East Fork of Des Moines River, water, 1,069; grade | 151.0 | 1092 |
| Livernore | 152.6 | 1136 |
| Bode | 158.1 | 1150 |
| West Bend | 168.6 | 1197 |
| Rodman | 174.9 | 1193 |
| Emmetsburg | 184.5 | 1234 |
| Des Moines River here, about | 184.5 | 1190 |
| Medium Lake, water, about 1,220; grade | 185.3 | 1224 |
| Des Moines River, low and high water, 1,212-1,228; grade .. | 193.7 | 1233 |
| Same, low and high water, 1,247-1,261; grade | 206.0 | 1270 |

RLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY—Continued.

VINTON TO WATERTOWN—Continued.

| | From Cedar Rapids. | Above the sea. |
|--|-----------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| ville..... | 207·0 | 1284 |
| oines River, low and high water, 1,254–1,268; grade. | 207·2 | 1291 |
| feet deep, grade..... | 213·7 | 1498 |
| it, cutting 3 feet, on the water-shed between the | | |
| issippi and Missouri Rivers..... | 217·0 | 1547 |
| ssion, grade..... | 221·5 | 1404 |
| Lake Station..... | 223·5 | 1457 |
| Lake, water..... | 223·5 | 1395 |
| fean depth of Spirit Lake, about 15 feet; maxi- | | |
| mum, in north part, 55 feet.) | | |
| East and West Okoboji Lakes, 1,390. The maximum | | |
| depth of the former, in its south part, is 20–25 feet; | | |
| of the latter, also in its south half, 90–125 feet.) | | |
| Sioux River, water, 1,387; grade..... | 230·0 | 1397 |
| Park, junction of the Worthington Branch..... | 234·0 | 1479 |
| edan..... | 246·0 | 1551 |
| edan Creek, water, 1,467; grade..... | 248·0 | 1479 |
| it, cutting 2 feet; grade..... | 253·4 | 1628 |
| ; near crossing of the Chicago, St. Paul, Minneap- | | |
| and Omaha Railway..... | 257·5 | 1502 |
| Creek, water, 1,493; grade..... | 258·3 | 1504 |
| Rock River, water, 1,440; grade..... | 265·0 | 1463 |
| it, cutting 14 feet; grade..... | 267·1 | 1513 |
| Creek, water, 1,481; grade..... | 268·0 | 1493 |
| line, grade..... | 271·4 | 1483 |
| orth, junction of the Sioux Falls Branch..... | 273·7 | 1445 |
| anzi Creek, water, 1,410; grade..... | 276·5 | 1422 |
| anzi..... | 279·3 | 1505 |
| River, water, ordinary and highest stages, 1,428– | | |
| 3; grade..... | 286·7 | 1437 |
| ne..... | 287·2 | 1452 |
| y..... | 305·0 | 1702 |
| one..... | 314·0 | 1725 |
| ovia..... | 319·4 | 1670 |
| reau Creek, water, 1,598; grade..... | 323·3 | 1620 |
| ia..... | 325·0 | 1693 |
| n, near crossing of the Chicago and Northwestern | | |
| way..... | 333·6 | 1742 |
| y Creek, water, 1,650; grade..... | 339·6 | 1656 |
| ell..... | 343·6 | 1694 |
| Creek, water, 1,652; grade..... | 344·5 | 1660 |
| ..... | 351·2 | 1778 |
| to..... | 361·1 | 1994 |
| it (crest of a spur of the Coteau des Prairies), | | |
| le..... | 361·5 | 1999 |
| of Clear Lake, water, 1,773; grade..... | 374·8 | 1778 |
| Lake Station..... | 375·3 | 1800 |
| am..... | 385·8 | 1936 |
| town, junction with the Wisconsin, Minnesota | | |
| Pacific (Minneapolis and St. Louis) Railway..... | 399·4 | 1734 |

BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY—Continued.

MADISON BRANCH.

This agrees with connecting railways at Garner and Madison.

| | From Cedar Rapids. | Above the sea. |
|---|--------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Dow's Station, junction with the Watertown line, 211 miles from Burlington..... | 112·9 | 1142 |
| Rowan..... | 119·5 | 1205 |
| Belmond..... | 128·0 | 1184 |
| Iowa River, water, 1,166; grade..... | 129·2 | 1172 |
| Goodell..... | 133·5 | 1236 |
| Iowa River, water, 1,182; grade..... | 138·5 | 1189 |
| Garner, crossing the Iowa and Dakota division of the Chicago, Milwaukee and St. Paul Railway..... | 145·6 | 1209 |
| Madison, junction with the Minneapolis and St. Louis Railway..... | 154·3 | 1214 |

WORTHINGTON BRANCH.

Agreeing with the Chicago, St. Paul, Minneapolis and Omaha Railway at Worthington.

| | From Cedar Rapids. | Above the sea. |
|---|--------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Lake Park, junction with the Watertown line, 332·1 miles from Burlington..... | 234·0 | 1479 |
| Round Lake Station..... | 244·3 | 1553 |
| Junction with the Chicago, St. Paul, Minneapolis and Omaha Railway, a half mile northeast of Worthington..... | 253·2 | 1590 |
| Worthington..... | 253·7 | 1585 |

SIOUX FALLS BRANCH.

Agreeing with connecting railways at Rock Rapids and Sioux Falls.

| | From Cedar Rapids. | Above the sea. |
|---|--------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Ellsworth, junction with the Watertown line, 371·8 miles from Burlington..... | 273·7 | 1445 |
| Rock River, low water..... | 283·0 | 1320 |
| Rock Rapids, near crossing of branch of the Chicago, St. Paul, Minneapolis and Omaha Railway..... | 283·6 | 1345 |
| Larchwood..... | 297·6 | 1462 |
| Granite..... | 304·5 | 1407 |
| Springdale..... | 309·5 | 1400 |
| Sioux Falls..... | 316·3 | 1400 |

FREMONT, ELKHORN AND MISSOURI VALLEY RAILROAD.

[From J. E. Ainsworth, engineer, Omaha.]

These profiles are referred to sea level in accordance with the elevation of the Missouri River at Blair, determined by the Missouri River Commission.

MAIN LINE, FROM MISSOURI VALLEY, IOWA, TO CASPER AND SOUTH PASS, WYO

| | From Missouri Valley. | Above the sea. |
|--|-----------------------|----------------|
| | Miles. | Feet. |
| Missouri Valley..... | 0-0 | 1002 |
| Missouri River near Blair, Nebr., ordinary low water, 988; grade..... | 11-0 | 1055 |
| Blair Summit, cutting 47 feet; grade..... | 16-4 | 1229 |
| Elkhorn River at Arlington, water, 1,149; grade..... | 30-3 | 1164 |
| Fremont..... | 37-2 | 1193 |
| Elkhorn River at Crowell, water, 1,254; grade..... | 65-8 | 1272 |
| Norfolk Junction..... | 118-1 | 1516 |
| Elkhorn River, water, 1,524; grade..... | 122-2 | 1541 |
| Elkhorn River north of Oakdale, water, 1,694; grade... | 149-7 | 1708 |
| Elkhorn River west of Neligh, water, 1,750; grade..... | 158-9 | 1763 |
| Elkhorn River east of O'Neill, water, 1,941; grade..... | 190-1 | 1951 |
| Stuart..... | 220-4 | 2151 |
| Long Pine..... | 250-8 | 2396 |
| Long Pine Creek, water, 2,298; grade..... | 251-9 | 2389 |
| Plum Creek, water, 2,498; grade..... | 273-0 | 2592 |
| Thacher..... | 300-5 | 2649 |
| Niobrara River, water, 2,392; grade..... | 303-8 | 2472 |
| Valentine..... | 306-8 | 2579 |
| Crookston..... | 318-0 | 2670 |
| Gordon..... | 397-1 | 3547 |
| Bordeaux Summit, surface and grade the same..... | 425-9 | 3888 |
| Chadron..... | 443-6 | 3360 |
| White River at Dakota Junction, water, 3,207; grade... | 448-3 | 3245 |
| Fort Robinson..... | 472-8 | 3775 |
| White River Summit, cutting 21 feet; grade..... | 495-9 | 4965 |
| Niobrara River near Van Tassell, water, 4,688; grade... | 507-7 | 4703 |
| Van Tassell..... | 508-5 | 4727 |
| Niobrara River at Lusk, water, 4,984; grade..... | 528-1 | 4999 |
| Lusk..... | 528-4 | 5007 |
| Niobrara River, water, 5,226; grade..... | 536-9 | 5236 |
| Niobrara Summit, 2 miles east of Keeline, cutting 6 feet; grade..... | 542-6 | 5340 |
| Fisher..... | 565-3 | 4752 |
| Douglas..... | 583-5 | 4810 |
| North Platte River, water, 4,787; grade..... | 586-2 | 4827 |
| Fetterman Hill, cutting 50 feet; grade..... | 590-5 | 4951 |
| La Prele Creek, water, 4,853; grade..... | 591-3 | 4917 |
| Casper (terminus, 1889)..... | 636-9 | 5118 |
| The continuation of this survey gives the following: | | |
| North Platte River at Casper, water..... | 636-9 | 5100 |
| Same, 5 miles west of Casper, water, 5,129; proposed grade..... | 642-0 | 5152 |
| Poison Spider Creek, water, 5,211; proposed grade..... | 649-5 | 5242 |
| Summit in Sec. 7, T. 31, R. 83, crossing the Rattlesnake Range, natural surface, 6,478; proposed grade..... | 668-5 | 6464 |
| Horse Creek, water, 5,961; proposed grade..... | 678-8 | 5977 |
| Sweet Water River in Sec. 13, T. 29, R. 89, water, 6,060; proposed grade..... | 705-4 | 6071 |
| Sweet Water River at Rongis, water, 6,310; proposed grade..... | 730-4 | 6318 |
| Sweet Water River at mouth of Sulphur Creek, water, 6,591; proposed grade..... | 751-6 | 6599 |
| South Pass (continental divide between the North Platte and Green Rivers), natural surface, 7,429; proposed grade..... | 796-2 | 7444 |

FREMONT, ELKHORN AND MISSOURI VALLEY RAILROAD—Continued.

BRANCH TO THE BLACK HILLS.

| | From Missouri Valley. | Above the sea. |
|---|--------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| White River, at Dakota Junction, water, 3,207; grade.. | 448.3 | 3245 |
| Horsehead Summit, cutting 3 feet; grade..... | 461.5 | 3664 |
| South Fork of the Cheyenne River, water, 2,918; grade.. | 493.0 | 2939 |
| Buffalo Gap..... | 499.2 | 3252 |
| Hermosa..... | 527.3 | 3295 |
| Rapid City..... | 547.3 | 3192 |
| Sturgis..... | 577.0 | 3467 |
| Whitewood Creek, water, 3,592; grade..... | 582.7 | 3602 |
| Whitewood (terminus, 1889)..... | 583.7 | 3640 |
| The continuation of this survey gives the following: | | |
| Whitewood Creek, water, 4,498; proposed grade..... | 592.8 | 4506 |
| Deadwood..... | 593.2 | 4545 |
| Pennington..... | 596.7 | 4972 |

ALTITUDES OF RIVERS.

ST. LAWRENCE RIVER SYSTEM.

| | Feet above the sea. |
|---|---------------------|
| Lakes on the Embarras River, where it intersects the Mesabi range, about..... | 1415-1320 |
| St. Louis River at the mouth of East Savanna River, about | 1260 |
| Same, head of rapids above Knife Falls | 1175 |
| Same, foot of Knife Falls..... | 1159 |
| Same, at the railroad bridge, Thomson, low and high water..... | 997-1020 |
| The following altitudes of the Laurentian Lakes are determined by the United States Lake Survey: | |
| Lake Superior (maximum depth, 1,026 feet), extreme low and high water, approximately, 599-604; mean, Nov. 1, 1870, to Jan. 31, 1888 | 601-56 |
| (Low stages of these lakes were in 1796, 1810, 1819 (the lowest recorded), 1828, 1847, 1865, and 1879; and high stages in 1788, 1814, 1838 (the highest recorded), 1858, 1876, and 1882.) | |
| Lakes Huron (maximum depth, 750 feet) and Michigan (maximum depth, 870 feet), extreme low and high water, approximately, 578-5-584-0; mean, Jan. 1, 1860, to Dec. 31, 1875..... | 581-28 |
| ("The mean surface of Lake Michigan above mean sea level at New York, as determined by the United States Lake Survey, is 581-28 feet. The mean surface of Lake Michigan above mean sea level at Biloxi, as determined by the Mississippi River Commission, is 580-83 feet."—Letter of A. Mackenzie, major U. S. engineers, Rock Island, Ill., Jan. 23, 1888.) | |
| Lake Erie (maximum depth, 210 feet), extreme low and high water, approximately, 570-575-5; mean, Jan. 1, 1860, to Dec. 31, 1875.. | 572-86 |
| Niagara River, at head of the rapids above Niagara Falls..... | 567 |
| Same, at brink of the American Falls | 526-518 |
| Same, at brink of the Canadian or Horseshoe Falls | 512 |
| Same, at foot of Niagara Falls | 357 |
| Same, at the lower suspension bridge | 347 |
| The foregoing notes of Niagara River are from L. Y. Schermerhorn in the Am. Jour. of Sci., third series, vol. 33, Apr., 1887, p. 280. | |
| Lake Ontario (maximum depth, 738 feet), extreme low and high water, approximately, 244-5-249; mean, Jan. 1, 1860, to Dec. 31, 1875 | 246-61 |

From Prof. J. W. Spencer's Elevations in the Dominion of Canada (Bull. U. S. Geological Survey, No. 6) are supplied the following notes of the St. Lawrence River:

| | From Montreal. | Above the sea. |
|---|----------------|----------------|
| | Miles. | Feet. |
| Mouth of Lake Ontario, Kingston..... | 178 | 246-61 |
| Galop's Rapids Canal | 111-6-101-0 | 239-223 |
| Rapide Plat Canal | 99-5- 95-5 | 223-208 |
| Farran's Point Canal | 85-0- 84-2 | 204-200 |
| Cornwall Canal (Long Sault) | 79-2- 67-7 | 200-151 |
| Lake St. Francis | 67-7- 35-0 | 151 |
| Beauharnois Canal | 35-0- 23-7 | 151- 67 |
| Lake St. Louis, junction of the Ottawa and St. Lawrence Rivers | 23-7- 8-5 | 67 |
| Lachine Canal | 8-5- 0-0 | 67- 23 |
| St. Lawrence River at the Victoria Bridge, Montreal, bed, 15; ordinary low water and extreme high water (April 1886)..... | | 33- 59 |
| Lake St. Peter, mouth of the Richelieu or Sorel River, to which high tide reaches | | 11 |

MISSISSIPPI RIVER SYSTEM.

[From leveling by United States engineers; from the Mississippi River Commission; and from railroad surveys.]

The Minnesota and Missouri River systems, tributary to the Mississippi, are separately presented.

MISSISSIPPI RIVER AND LAKES NEAR ITS SOURCE.

Southward to Grafton, Ill., from leveling by United States engineers, the portion from Cass Lake to St. Paul being done under the direction of Maj. C. J. Allen, St. Paul, and that from St. Paul to Grafton under the direction of Maj. A. Mackenzie, Rock Island, Ill. In the series southward from St. Paul to Grafton the stage of low water noted is that of 1864, being extreme low water. The average stage for the year is 5 to 7 feet higher. The stage of high water noted along the same distance (unless otherwise designated) is that of 1880, which was an exceptionally high flood, rarely or never exceeded, along the distance from Lake Pepin to Rock Island. South of Savanna, Ill., these elevations are determined from precise leveling between the Gulf of Mexico and Lake Michigan by the Mississippi River Commission. Continuing north from Savanna, the series supplied by Maj. Mackenzie, which is accepted without change, shows a discrepancy at St. Paul of 1.71 feet above the elevation determined there by Major Allen. Besides the elevations supplied by the United States engineers, others are added from railroad surveys or are inserted by estimation, these being distinguished below St. Paul to Grafton by inclosure in parentheses.

From Cairo southward these elevations are derived from leveling and gauge records of the Mississippi River Commission in report on "Stages of the Mississippi River from Cairo to Carrollton, 1887" (therein referred at each station to the zero of its gauge, with note of the elevation of the zero above the Cairo datum plane). Besides this publication, the secretary of the Commission supplied manuscript records of St. Louis and for the year 1887 at Cairo, Memphis, Natchez, and Carrollton. [Apparently an error of a few feet exists in the determination of the heights of gauges along the the lower part of the river, by which its lowest stage at Baton Rouge and southward falls slightly below mean sea level.]

| | Feet above the sea. |
|---|---------------------|
| Lake Itasca, Apr. 22, 1889 (according to leveling by Mr. J. V. Brower from a bench mark of the survey for extension of the Fosston Branch of the St. Paul, Minneapolis and Manitoba Railway)..... | 1462 |
| (The range of this lake between its lowest and highest stages since 1880 has not exceeded 8 inches. Its maximum depth in the southeast arm is about 80 feet. Elk Lake is 1 foot above Lake Itasca. The crest of the watershed 2 miles west and south is 150 to 250 feet above Lake Itasca, or about 1,600 to 1,700 feet above the sea.) | |
| Mississippi River at the proposed crossing of the St. Paul, Minneapolis and Manitoba Railway in Sec. 8, T. 145, R. 35, about 11 miles north of Lake Itasca | 1373 |
| Lake Pemidji | 1355 |
| Cass Lake | 1300-1302 |
| Mouth of Horn River | 1298 |
| Horn Lake | 1309 |
| Lake Winnebagoishish, also Little Winnebagoishish Lake, formerly. | 1290-1293 |
| Lake Winnebagoishish, as raised by dam of reservoir system | 1298 |
| (This dam is constructed with capacity to raise the lake to 1,304.3 feet, but to the close of the year 1887 the highest level to which it had been raised was 1,298 feet. It is not expected that it will be raised more than 1½ feet above that level during at least several years to come.) | |
| Lake in Secs. 3 and 10, T. 146, R. 26, on the East Branch of Cut Foot Sioux Creek | 1298 |
| Head of East Branch of Cut Foot Sioux Creek, 1 mile from Bow String Lake | 1306 |
| Height of land between Lake Winnebagoishish and Bow String Lake | 1345 |
| Bow String Lake, head of the Big Fork of Rainy River | 1321 |
| Head and foot of small rapids 3 miles below Little Winnebagoishish Lake | 1288-1287 |
| Mouth of Leech Lake River | 1279 |
| Ball Club Lake | 1281 |
| Mud Lake | 1280-1283 |

| | Feet above the sea. |
|--|---------------------|
| Leech Lake, formerly..... | 1293-1295 |
| Same, as raised by dam of reservoir system..... | 1297 |
| (The maximum depth of Leech Lake, in its southwest bay, is about 100 feet.) | |
| Highest level to which it is expected that this lake may be raised within the next 5 years..... | 1298-5 |
| Stage of maximum capacity of the Leech Lake dam..... | 1299-5 |
| Portage Lake..... | 1299 |
| Height of land on trail from Leech Lake to Lake Winnebagoishish..... | 1324 |
| Height of land south of Leech Lake, about half way to Fourteen Mile Creek..... | 1500 |
| Fourteen Mile Creek on road south from Leech Lake to Brainerd.. | 1375 |
| North Branch of Pine River at crossing of this road..... | 1323 |
| Pine River at crossing of this road..... | 1274 |
| Hay Creek at crossing of this road..... | 1238 |
| South Branch of Hay Creek at crossing of this road..... | 1243 |
| Lower Hay Lake, formerly..... | 1225 |
| (This lake is now raised by dam to 1,227.) | |
| White Fish Lake, formerly..... | 1224 |
| Same, as raised by Pine River dam at outlet of Cross Lake..... | 1227 |
| Highest level to which it is expected that Cross and White Fish lakes may be raised within the next few years..... | 1231 |
| Stage of maximum capacity of the Pine River dam..... | 1236-7 |
| Pelican Lake..... | 1211 |
| Upper Gull Lake, above the dam..... | 1200 |
| Gull Lake..... | 1194-1196 |
| Cullen Lake..... | 1196 |
| Sylvan Lake..... | 1201 |
| Round Lake..... | 1195-1196 |
| Lake Hubert..... | 1199 |
| Long Lake..... | 1200 |
| Red Sand Lake..... | 1201 |
| Mississippi River at White Oak Point..... | 1276 |
| Same, mouth of Vermilion River..... | 1273 |
| Vermilion Lake..... | 1278 |
| Mississippi River at mouth of outlet of Pokegama Lake, formerly.. | 1270 |
| Pokegama Lake, formerly..... | 1271 |
| Same, as raised by dam of reservoir system..... | 1275 |
| Bass Lake..... | 1279 |
| Little Bass Lake..... | 1283 |
| Head of Pokegama Falls, formerly..... | 1269 |
| Same, as raised by dam of reservoir system, flowing Pokegama Lake..... | 1275 |
| Foot of Pokegama Falls, 900 feet from the last..... | 1254 |
| Head of Grand Rapids, $3\frac{1}{4}$ miles below Pokegama Falls..... | 1253 |
| Foot of Grand Rapids, $\frac{1}{2}$ mile from the last, at head of navigation of the Mississippi..... | 1248 |
| Mouth of Split Hand River..... | 1236 |
| Mouth of Sandy River, nearly the same level as Sandy Lake..... | 1210 |
| Mississippi River at Aitkin..... | 1190 |
| Mouth of Pine River..... | 1177 |
| Head and foot of Big Eddy Rapids, $\frac{1}{2}$ mile long..... | 1170-1167 |
| Head and foot of Island Rapids, 3,000 feet long..... | 1164-1162 |
| French Rapids, between 3 and 4 miles above Brainerd, 4,000 feet long, about..... | 1159-1154 |
| Mississippi River at Brainerd, low and high water..... | 1150-1167 |
| Mouth of Crow Wing River, low and high water..... | 1145-1163 |
| Mouth of Nokasippi River, near Fort Ripley..... | 1139 |
| Head and foot of Conrad's Shoals, $\frac{1}{2}$ mile long, 9 miles below Fort Ripley..... | 1106-1104 |
| Little Elk Rapids, 1 mile long, near the mouth of Little Elk River | 1102-1095 |
| Rapids about $\frac{1}{2}$ mile long, Little Falls..... | 1090-1079 |
| (A dam recently built here raises the river above these rapids to 1,099 feet, flowing back to the middle of the Little Elk Rapids. The head obtained by the Little Falls dam and canal is 20 feet, from 1,099 to 1,079.) | |
| Pike Rapids, $\frac{1}{2}$ mile long..... | 1067-1064 |

| | Feet above the sea. |
|--|---------------------|
| At upper end of island, McDougall's Rapids | 1033 |
| Mouth of Platte River | 1026 |
| (Platte River at the highway bridge, 1,035; at the railway bridge, 1,059.) | |
| Mouth of Little Rock River | 1003 |
| At Watab | 1001 |
| Watab Rapids, 800 feet long | 1000-998 |
| Mouth of Sauk River, above the dam at Sauk Rapids | 988 |
| At foot of breakwater, Sauk Rapids | 980 |
| At railroad bridge, St. Cloud, low water before the dam was built.. | 965 |
| Head and foot of St. Cloud dam, $\frac{1}{2}$ mile below the last | 975-962 |
| (The canal here, 900 feet long, gives a fall of 15 feet, from 975 to 960.) | |
| At St. Augusta and foot of the "Thousand Islands" | 946 |
| At Clearwater, low and high water | 936-954 |
| At head of Bear Island, about a mile east from the mouth of Silver Creek | 920 |
| At Monticello | 891 |
| At Elk River | 851 |
| Mouth of Crow River, Dayton | 839 |
| Mouth of Rum River, Anoka | 825 |
| Mouth of Rice Creek, Fridley | 800 |
| At Minneapolis, crest of St. Anthony's Falls, ordinary and highest stages | 794-802 |
| Same, under the stone arch bridge, low water | 739-743 |
| Same, at the lower end of Hennepin Island | 738 |
| Same, at the St. Paul and Northern Pacific Railroad bridge, 1 mile below the falls | 720 |
| At the short line bridge, Chicago, Milwaukee and St. Paul Railway, low and high water | 709-724 |
| At Fort Snelling bridge | 690 |
| Mouth of Minnesota River, low and high water | 688-710 |
| At St. Paul, extreme low water, 1864, and Dec. 3 and 4, 1878, 683.04; lowest stage in ordinary years, 685; high water, 1880, 697.94; extreme high water, Apr. 29, 1881, 702.04 | 683-702 |
| [These elevations at St. Paul are Major Allen's determinations, to which the series thence southward, supplied by Major Mackenzie, would add 1.71 feet.] | |
| (At Red Rock, Minn., 6 miles below St. Paul, low water | 680) |
| (At Newport, Minn., low water | 679) |
| (At the mouth of Gray Cloud Slough, 5 miles above Hastings, low water | 673) |
| (At Nininger, Minn., low water | 672) |
| At Hastings, Minn., low and high water | 670-60-687-30 |
| (Same, extreme high water, 1881, about | 690) |
| (Mouth of the St. Croix River, Prescott, Wis., extreme low and high water, about | 667-687) |
| At Red Wing, Minn., low and high water | 664-50-680-65 |
| (Lake Pepin (maximum depth, near its south end, 60 feet) low and high water | 664-680-5) |
| (At Read's Landing, Minn., low and high water | 663-7-680-4) |
| At Wabasha, Minn., low and high water | 661-60-681-32 |
| (The record of a flood stage here slightly higher than at Red Wing above Lake Pepin is probably due to the inflow from the Chippewa River, which joins the Mississippi near Wabasha. See Geology of Minnesota, vol. 2, p. 26.) | |
| At Alma, Wis., low and high water | 655-93-672-18 |
| At Minneiska, Minn., low and high water | 649-94-665-64 |
| At Fountain City, Wis., low and high water | 644-16-660-10 |
| At Winona, Minn., low and high water | 639-19-656-27 |
| (At Trempealeau, Wis., low water | 636) |
| (At Dresbach, Minn., low water | 632) |
| At La Crosse, Wis., low and high water | 627-99-643-49 |
| At Brownsville, Minn., low and high water | 622-10-637-81 |
| (At the southeast corner of Minnesota, low and high water, about | 616-634-5) |
| At Victory, Wis., low and high water | 615-39-634-01 |
| At Lansing, Iowa, low and high water | 612-24-631-84 |

Feet above the sea.

| | |
|---|---------------|
| At Prairie du Chien, Wis., low water, 604·28; high water, 1881, 623·28; extreme high water, 1880, about 626·20 | 604·28-626·20 |
| At North McGregor, Iowa, low and high water | 603·97-625·97 |
| (Mouth of the Wisconsin River, low and high water, about | 603-625) |
| At Clayton, Iowa, low and high water | 601·42-622·70 |
| At Glen Haven, Wis., low and high water | 599·75-619·70 |
| At Cassville, Wis., low and high water | 594·99-616·46 |
| At Specht's Ferry, Iowa, low and high water | 589·85-610·80 |
| At Dubuque, Iowa, low and high water | 584·75-606·65 |
| At Bellevue, Iowa, low and high water | 577·87-598·02 |
| At Savanna, Ill., low and high water | 572·12-591·75 |
| At Fulton, Ill., low and high water | 566·48-586·68 |
| At Clinton, Iowa, low and high water | 565·89-586·18 |
| At Le Claire, Iowa, at the head of the Rock Island Rapids, low and high water | 562·25-576·25 |
| At Rock Island, Ill., at the foot of the rapids, 12 miles from Le Claire, low and high water | 541·56-559·96 |
| At Muscatine, Iowa, low water, 530·53; high water, 1881, 547·10 .. | 530·5-547 |
| At Port Louisa, Iowa, low and high water | 525·52-541·67 |
| At New Boston, Ill., nearly opposite to the mouth of the Iowa River, low and high water | 523·45-539·34 |
| At Keithsburg, Ill., low and high water | 522·71-536·16 |
| At Oquawka, Ill., low and high water | 515·63-531·15 |
| At Burlington, Iowa, low and high water | 510·77-526·51 |
| (Notes from William Steyh, city engineer, supply the following elevations in Burlington: | |
| Mississippi River, extreme high water, 1851 and 1881 | 531 |
| Union depot | 533) |
| At Appanoose, Ill., low and high water | 502·36-518·09 |
| At Fort Madison, Iowa, low and high water | 501·87-517·59 |
| At Montrose, Iowa, at the head of the Des Moines Rapids, low water, 500·09; high water, 1881, 511·38; high water, 1851, 513·66 .. | 500-513 |
| At Keokuk, Iowa, at the foot of the rapids, 8 miles from Montrose, low and high water | 476·96-494·46 |
| (Mouth of the Des Moines River, at the southeast corner of Iowa, low and high water, about | 475·5-493) |
| At Alexandria, Mo., low water | 474·51 |
| (Same, extreme high water | 496) |
| At Gregory's Landing, Mo., low and high water | 471·64-488·09 |
| At Canton, Mo., low and high water | 466·19-479·39 |
| At Quincy, Ill., low and high water | 458·21-474·76 |
| At Hannibal, Mo., low and high water | 450·12-467·42 |
| (Same, high water, 1851 | 472) |
| At Louisiana, Mo., low and high water | 437·11-452·91 |
| At Clarksville, Mo., low and high water | 433·05-448·25 |
| (Mouth of the Illinois River, low and high water, about | 407-424) |
| (Same, extreme high water, about | 435) |
| At Grafton, Ill., low and high water | 405·46-422·43 |
| Mouth of the Missouri River, extreme low and high water, approximately | 395-435 |
| At St. Louis, Mo., zero of gauge, 378·97; extreme low and high water, 1870 to 1887 (range 33·78 feet) | 379·99-413·77 |
| [Same, bed, 363, extreme low water, 379; high water, 1844 (range, 49 feet), 428.—Gannett's Dictionary of Altitudes.] | |
| St. Louis directrix | 412·71 |
| The lowest and highest stages of the river here during the years 1870 to 1887 were as follows: | |
| 1870, l. w., Dec. 24, 384·23; h. w., Apr. 16, 405·18. | |
| 1871, l. w., Dec. 21, 381·81; h. w., March 17, 400·79. | |
| 1872, l. w., Dec. 4, 380·72; h. w., June 12, 400·87. | |
| 1873, l. w., Nov. 30, 382·84; h. w., Apr. 11, 403·22. | |
| 1874, l. w., Dec. 31, 381·77; h. w., Mar. 22, 399·03. | |
| 1875, l. w., Jan. 3, 381·27; h. w., July 11, 407·72. | |
| 1876, l. w., Dec. 9, 385·77; h. w., May 10, 410·97. | |
| 1877, l. w., Oct. 4, 385·82; h. w., June 14, 405·57. | |
| 1878, l. w., Dec. 25, 384·62; h. w., June 15, 404·72. | |
| 1879, l. w., Dec. 26, 382·47; h. w., July 3, 400·12. | |
| 1880, l. w., Nov. 29, 381·77; h. w., July 12, 404·47. | |

Feet above the sea.

| | |
|--|---------------|
| 1881, l. w., Feb. 5, 386.52; h. w., May 6, 412.62. | |
| 1882, l. w., Dec. 18, 381.82; h. w., July 5, 411.17. | |
| 1883, l. w., Jan. 12, 383.42; h. w., June 26, 413.77. | |
| 1884, l. w., Jan. 5, 382.12; h. w., Apr. 9, 407.07. | |
| 1885, l. w., Dec. 15, 381.07; h. w., June 17, 406.07. | |
| 1886, l. w., Dec. 5, 380.42; h. w., May 13, 405.97. | |
| 1887, l. w., Dec. 27, 379.99; h. w., Apr., 399.52. | |
| (At Fountain Bluff, Ill., low and high water.....) | 313-357) |
| (At Thebes, Ill., low and high water.....) | 291-339) |
| Mouth of the Ohio River, Cairo, Ill., zero of gauge..... | 269.58 |
| Extreme low and high water, 1871 to 1887 (range 52.17 feet)..... | 269.58-321.75 |
| Cairo datum-plane,—21.26 feet (below mean tide in the Gulf of Mexico). | |
| The lowest and highest stages of the river here during the years 1871 to 1887 were as follows: | |
| 1871, l. w., Dec. 26, 269.58. | |
| 1872, l. w., Dec. 6, 270.58; h. w., Apr. 19, 308.78. | |
| 1873, l. w., Oct. 16, 272.18; h. w., Feb. 26, 311.13. | |
| 1874, l. w., Nov. 13, 272.58; h. w., Apr. 26, 316.95. | |
| 1875, l. w., Jan. 26, 274.88; h. w., Aug. 8, 314.70. | |
| 1876, l. w., Dec. 29-31, 270.68; h. w., Apr. 6, 315.96. | |
| 1877, l. w., Jan. 1, 270.58; h. w., Apr. 15, 310.10. | |
| 1878, l. w., Oct. 22, 275.50; h. w., Apr. 29, 306.62. | |
| 1879, l. w., Oct. 10, 272.26; h. w., Dec. 31, 306.08. | |
| 1880, l. w., Nov. 29, 275.28; h. w., Mar. 22, 314.18. | |
| 1881, l. w., Jan. 7 and 9, and Sept. 9, 274.98; h. w., Apr. 20, 315.38. | |
| 1882, l. w., Dec. 19, 276.88; h. w., Feb. 26, 321.45. | |
| 1883, l. w., Sept. 30, 274.28; h. w., Feb. 27, 321.75. | |
| 1884, l. w., Dec. 10, 276.88; h. w., Feb. 23, 321.37. | |
| 1885, l. w., Oct. 20, 277.88; h. w., Jan. 26, 308.58. | |
| 1886, l. w., Nov. 11, 273.38; h. w., Apr. 19, 320.56. | |
| 1887, l. w., Dec. 31, 271.60; h. w., Mar. 9, 318.16. | |
| At Columbus, Ky., and Belmont, Mo., zero of gauge..... | 207.68 |
| Extreme low and high water, 1882 to 1886 (range, 41.40 feet)..... | 270.28-311.68 |
| (Same, extreme low water, about.....) | 264) |
| The lowest and highest stages of the river here during the years 1882 to 1886 were as follows: | |
| 1882, l. w., not recorded; h. w., Feb. 26, 310.67. | |
| 1883, l. w., Sept. 30, 270.48; h. w., not recorded. | |
| 1884, l. w., Dec. 10, 272.73; h. w., Feb. 23, 311.68. | |
| 1885, l. w., Oct. 20, 273.79; h. w., Jan. 26, 301.93. | |
| 1886, l. w., Nov. 12, 270.28; h. w., Apr. 19, 310.45. | |
| (At Hickman, Ky., extreme low and high water, about.....) | 257-303) |
| At New Madrid (Morrisson's Landing), Mo., zero of gauge..... | 254.78 |
| Extreme low and high water, 1879 to 1886 (range 41.67 feet)..... | 254.61-296.28 |
| The lowest and highest stages of the river here during the years 1879 to 1886 were as follows: | |
| 1879, l. w., Nov. 12, 254.61. | |
| 1880, l. w., Nov. 30, 256.98; h. w., Mar. 24, 289.48. | |
| 1881, l. w., Jan. 8, 254.78; h. w., not recorded. | |
| 1882, l. w., Dec. 19, 258.49; h. w., not recorded. | |
| 1883, l. w., Oct. 1, 256.50; h. w., not recorded. | |
| 1884, l. w., Dec. 10, 258.73; h. w., Feb. 24, 296.28. | |
| 1885, l. w., Oct. 21, 260.09; h. w., Jan. 26, 286.20. | |
| 1886, l. w., Nov. 13, 256.71; h. w., Apr. 20, 295.16. | |
| At Cottonwood Point, Mo., zero of gauge..... | 229.36 |
| Extreme low and high water, 1879 to 1884 (range, 37.80 feet)..... | 229.41-267.21 |
| The lowest and highest stages of the river here during the years 1879 to 1884 were as follows: | |
| 1879, l. w., Nov. 16, 229.41. | |
| 1880, l. w., Nov. 30, 231.51; h. w., Mar. 25, 264.86. | |
| 1881, l. w., Jan. 8, 230.96; h. w., Apr. 24, 264.56. | |
| 1882, l. w., Dec. 20, 233.01; h. w., Feb. 28, 266.86. | |
| 1883, l. w., Oct. 1, 230.36; h. w., Feb. 28, 267.21. | |
| 1884, l. w., Dec. 10, 232.11; h. w., Feb. 25, 266.81. | |
| At Fulton, Tenn., zero of gauge..... | 207.29 |
| Extreme low and high water, 1879 to 1886 (range, 34.59 feet)..... | 209.39-243.98 |

Feet above the sea.

The lowest and highest stages of the river here during the years

1879 to 1886 were as follows:

1879, l. w., Nov. 14, 209.39.
 1880, l. w., Nov. 1, 211.94; h. w., Mar. 26, 241.44.
 1881, l. w., Jan. 9, 211.33; h. w., Apr. 26, 241.56.
 1882, l. w., Dec. 20, 213.93; h. w., Mar. 1, 243.98.
 1883, l. w., Oct. 1, 211.97; h. w., Mar. 2, 243.53.
 1884, l. w., Dec. 11, 212.77; h. w., Feb. 25-29, 242.97.
 1885, l. w., Oct. 21, 213.57; h. w., Jan. 28, 237.21.
 1886, l. w., Nov. 14, 211.15; h. w., Apr. 22, 242.65.

At Memphis, Tenn., zero of gauge.....
 Extreme low and high water, 1872 to 1887 (range, 36.25 feet)

182.71
 181.76-218.01

The lowest and highest stages of the river here during the years

1872 to 1887 were as follows:

1872, l. w., Dec. 25, 181.76; h. w., Apr. 24, 214.21.
 1873, l. w., Oct. 30, 183.71; h. w., Mar. 3, 215.21.
 1874, l. w., Nov. 16, 184.11; h. w., May 2, 216.71.
 1875, l. w., Jan. 27, 185.91; h. w., Aug. 16, 215.76.
 1876, l. w., Dec. 30, 183.91; h. w., Apr. 8, 216.79.
 1877, l. w., Jan. 2, 183.46; h. w., Apr. 29, 214.76.
 1878, l. w., Nov. 3, 185.61; h. w., May 2, 211.81.
 1879, l. w., Oct. 9-12, and Nov. 11, 183.76; h. w., Jan. 29, 210.81.
 1880, l. w., Oct. 31, 185.31; h. w., Mar. 24-29, 216.11.
 1881, l. w., Sept. 11, 184.81; h. w., Apr. 27, 216.01.
 1882, l. w., Dec. 21, 186.21; h. w., Mar. 6 and 9, 217.86.
 1883, l. w., Oct. 2, 184.61; h. w., Mar. 7, 217.46.
 1884, l. w., Dec. 11, 185.81; h. w., Mar. 2, 216.86.
 1885, l. w., Oct. 22, 186.86; h. w., Jan. 28, 211.96.
 1886, l. w., Nov. 15, 185.21; h. w., Apr. 28, 217.51.
 1887, l. w., Nov. 20, 183.91; h. w., Mar. 10, 218.01.

At Moon's Landing, Miss., zero of gauge.....
 Extreme low and high water, 1882 to 1884 (range, 37.80 feet)

160.22
 162.62-200.42

The lowest and highest stages of the river here during the years

1882 to 1884 were as follows:

1882, l. w., Dec. 22, 166.17; h. w., Mar. 8, 200.02.
 1883, l. w., Oct. 1, 162.62; h. w., Mar. 8, 200.42.
 1884, l. w., Dec. 12, 162.82; h. w., March 5, 199.10.

At Helena, Ark., zero of gauge.....
 Extreme low and high water, 1872 to 1886 (range, 48.10 feet)

140.72
 140.72-188.82

The lowest and highest stages of the river here during the years

1872 to 1886 were as follows:

1872, l. w., Dec. 26, 140.72; h. w., Apr. 26, 179.75.
 1873, l. w., Oct. 17-22, 144.72; h. w., Mar. 6, 180.72.
 1874, l. w., Nov. 16, 144.42; h. w., May 11, 186.54.
 1875, l. w., Jan. 28, 147.22; h. w., Apr. 13, 183.12.
 1876, l. w., Dec. 31, 143.72; h. w., Apr. 18, 185.57.
 1877, l. w., Jan. 4, 142.42; h. w., Apr. 30, 182.52.
 1878, l. w., Nov. 3, 147.97; h. w., May 3, 179.47.
 1879, l. w., Nov. 14, 144.82; h. w., Jan. 31, 177.97.
 1880, l. w., Nov. 3, 148.82; h. w., Apr. 1, 184.41.
 1881, l. w., Sept. 15, 146.97; h. w., May 14, 184.46.
 1882, l. w., Dec. 22, 149.32; h. w., Mar. 9, 187.92.
 1883, l. w., Oct. 1, 147.12; h. w., Mar. 8, 187.62.
 1884, l. w., Dec. 13, 147.97; h. w., Mar. 6, 187.72.
 1885, l. w., Oct. 23, 148.72; h. w., Jan. 30, 181.42.
 1886, l. w., Nov. 16, 143.72; h. w., Apr. 30, 188.82.

At Glendale, Miss., zero of gauge.....
 1880, l. w., not recorded; h. w., Apr. 3, 184.47.

146.81

1881, l. w., not recorded; h. w., May 13, 184.71.
 At St. Louis Landing, Ark., zero of gauge.....

120.01

1884, l. w., Dec. 13, 134.71; h. w., Mar. 6, 168.21.
 At Sunflower Landing, Miss., zero of gauge.....

125.87

1883, l. w., Oct. 1-4, 131.17; h. w., Mar. 10, 167.62.

At Malone's Landing, Miss., zero of gauge.....

133.70

Extreme low and high water, 1880 to 1882 (range, 31.02 feet)

132.30-166.32

The lowest and highest stages of the river here during the years

1880 to 1882 were as follows:

1880, l. w., Nov. 3, 123.80; h. w., not recorded.
 1881, l. w., Sept. 19, 132.30; h. w., May 14, 164.60.

Feet above the sea.

| | |
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| 1832, l. w., Dec. 24, 133·80; h. w., Feb. 28, 166·32. | |
| Mouth of White River, Ark., zero of gauge..... | 107·47 |
| Extreme low and high water, 1872 to 1886 (range, 48·40 feet) | 107·47-155·87 |
| The lowest and highest stages of the river here during the years 1872 to 1886 were as follows: | |
| 1872, l. w., Dec. 28, 107·47; h. w., Apr. 30, 147·67. | |
| 1873, l. w., not recorded; h. w., Apr. 25, 150·37. | |
| 1874, l. w., Nov. 16, 110·17; h. w., not recorded. | |
| 1875, l. w., Jan. 2·4, 114·27; h. w., Apr. 16, 152·47. | |
| 1876, l. w., Dec. 26, 110·37; h. w., Apr. 8-15, 154·17. | |
| 1877, l. w., Jan. 8, 109·67; h. w., May 5, 152·07. | |
| 1878, records lacking. | |
| 1879, l. w., Oct. 14, 109·87; h. w., not recorded. | |
| 1880, l. w., Nov. 4, 114·47; h. w., Apr. 24, 154·02. | |
| 1881, l. w., Sept. 14, 112·97; h. w., May 15-18, 153·17. | |
| 1882, l. w., Dec. 23, 117·17; h. w., Feb. 28, 155·87. | |
| 1883, l. w., Oct. 3, 114·27; h. w., Mar. 9-12, 155·47. | |
| 1884, l. w., Dec. 13, 116·47; h. w., Mar. 7, 155·37. | |
| 1885, l. w., Oct. 24, 117·47; h. w., Jan. 24, 151·07. | |
| 1886, l. w., Nov. 15, 113·37; h. w., May 4, 155·67. | |
| At Arkansas City, Ark., zero of gauge..... | 95·09 |
| Extreme low and high water, 1880 to 1886 (range, 45·20 feet) | 96·89-142·09 |
| The lowest and highest stages of the river here during the years 1880 to 1886 were as follows: | |
| 1880, l. w., Nov. 4, 100·99; h. w., Apr. 3, 140·94. | |
| 1881, l. w., Jan. 14, 96·89; h. w., May 17, 139·39. | |
| 1882, l. w., Dec. 23, 102·64; h. w., Feb. 28, 142·09. | |
| 1883, l. w., Oct. 3, 99·34; h. w., Mar. 11, 141·41. | |
| 1884, l. w., Dec. 13, 102·59; h. w., Mar. 8, 141·59. | |
| 1885, l. w., Oct. 25, 102·79; h. w., May 8, 137·69. | |
| 1886, l. w., Nov. 16, 98·09; h. w., May 5, 141·99. | |
| At Greenville, Miss., zero of gauge..... | 86·74 |
| Extreme low and high water, 1882 to 1886 (range, 37·48 feet)..... | 90·94-128·42 |
| The lowest and highest stages of the river here during the years 1882 to 1886 were as follows: | |
| 1882, l. w., Dec. 23, 94·09; h. w., Feb. 27, 128·42. | |
| 1883, l. w., Oct. 4, 92·36; h. w., Mar. 11, 127·14. | |
| 1884, l. w., Dec. 13, 94·64; h. w., Mar. 8, 127·84. | |
| 1885, l. w., Oct. 25, 95·04; h. w., May 8, 124·79. | |
| 1886, l. w., Nov. 16, 90·94; h. w., May 6, 127·91. | |
| At Refuge, Miss., zero of gauge..... | 81·53 |
| Extreme low and high water, 1879 to 1881 (range, 40·00 feet) | 83·83-123·83 |
| The lowest and highest stages of the river here during the years 1879 to 1881 were as follows: | |
| 1879, l. w., Oct. 28, 83·83. | |
| 1880, l. w., Nov. 6, 85·03; h. w., Mar. 23-27, 123·83. | |
| 1881, l. w., Sept. 20, 85·13; h. w., May 18, 123·53. | |
| At Wilson's Point, La., zero of gauge..... | 72·19 |
| 1884, l. w., Dec. 14, 78·69; h. w., Mar. 23, 110·00. | |
| At Lake Providence, La., zero of gauge..... | 68·36 |
| Extreme low and high water, 1872 to 1886 (range, 42·25 feet)..... | 64·51-106·76 |
| The lowest and highest stages of the river here during the years 1872 to 1886 were as follows: | |
| 1872, l. w., Dec. 29, 64·51; h. w., May 1, 103·51. | |
| 1873, l. w., Nov. 4, 69·27; h. w., May 28, 104·48. | |
| 1874, l. w., Nov. 16, 69·31; h. w., Mar. 22, 105·73. | |
| 1875, l. w., Nov. 12, 74·26; h. w., Apr. 19, 105·65. | |
| 1876, l. w., Dec. 31, 69·61; h. w., Apr. 13, 106·31. | |
| 1877, l. w., Jan. 1-3, 69·61; h. w., May 6, 104·18. | |
| 1878, l. w., Oct. 27 and Nov. 5, 72·11; h. w., Mar. 23, 104·16. | |
| 1879, l. w., Oct. 16, 68·91; h. w., Feb. 15, 104·36. | |
| 1880, l. w., Nov. 3, 73·56; h. w., Apr. 3, 106·41. | |
| 1881, l. w., Sept. 14-19, 71·36; h. w., Mar. 11, 104·53. | |
| 1882, l. w., Dec. 25, 74·26; h. w., Mar. 20, 106·68. | |
| 1883, l. w., Oct. 2, 72·56; h. w., Mar. 11-14, 104·83. | |
| 1884, l. w., Dec. 15, 73·91; h. w., Mar. 23, 106·76. | |
| 1885, l. w., Oct. 26, 74·76; h. w., May 10, 103·91. | |
| 1886, l. w., Nov. 19, 70·91; h. w., May 7, 106·27. | |

| | Feet above the sea. |
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| At Hay's Landing, Miss. (Point Lookout, La.), zero of gauge..... | 64.79 |
| Extreme low and high water, 1882 and 1884 (range, 35.94 feet) | 67.57-103.51 |
| 1882, l. w., Nov. 3, 70.83; h. w., Mar. 20, 103.38. | |
| 1884, l. w., Dec. 14, 67.57; h. w., Mar. 24, 103.51. | |
| At Vicksburg, Miss., zero of gauge..... | 44.78 |
| Extreme low and high water, 1872 to 1886 (range, 50.30 feet)..... | 43.48-93.78 |
| The lowest and highest stages of the river here during the years 1872 to 1886 were as follows: | |
| 1872, l. w., Dec. 30, 43.48; h. w., May 2, 84.28. | |
| 1873, l. w., Jan. 1, 47.13; h. w., May 20, 85.38. | |
| 1874, l. w., Nov. 16 and 21, 47.93; h. w., May 2-5, 90.48. | |
| 1875, l. w., Nov. 14, 52.88; h. w., Apr. 21, 87.78. | |
| 1876, l. w., Dec. 30, 48.83; h. w., May 10, 89.68. | |
| 1877, l. w., Jan. 6, 47.03; h. w., May 8-13, 86.38. | |
| 1878, l. w., not recorded; h. w., March 24-27, 85.73. | |
| 1879, l. w., not recorded; h. w., Feb. 17, 84.23. | |
| 1880, l. w., Oct. 27, 52.48; h. w., Apr. 8, 87.93. | |
| 1881, l. w., Sept. 19, 48.43; h. w., Mar. 11, 86.63. | |
| 1882, l. w., Nov. 4, 53.28; h. w., Mar. 20, 93.53. | |
| 1883, l. w., Oct. 6, 47.68; h. w., Apr. 7, 88.58. | |
| 1884, l. w., Dec. 15, 49.63; h. w., Mar. 25, 93.78. | |
| 1885, l. w., Oct. 26, 49.68; h. w., May 11, 85.68. | |
| 1886, l. w., Nov. 16, 44.78; h. w., May 8, 88.93. | |
| At St. Joseph, La., zero of gauge..... | 31.48 |
| Extreme low and high water, 1882 to 1884 (range, 40.95 feet) | 35.43-76.38 |
| The lowest and highest stages of the river here during the years 1882 to 1884 were as follows: | |
| 1882, l. w., Nov. 5-11, 39.58; h. w., Mar. 20, 76.38. | |
| 1883, l. w., Oct. 8, 35.68; h. w., Apr. 7, 73.38. | |
| 1884, l. w., Dec. 16, 35.43; h. w., Mar. 24, 76.37. | |
| At Natchez, Miss., zero of gauge..... | 15.57 |
| Extreme low and high water 1872 to 1887 (range, 47.75 feet) | 15.57-63.32 |
| The lowest and highest stages of the river here during the years 1872 to 1887 were as follows: | |
| 1872, l. w., Dec. 15, 15.57; h. w., May 2-5, 55.42. | |
| 1873, l. w., Jan. 1, 16.52; h. w., May 30, 55.72. | |
| 1874, l. w., Nov. 17, 18.27; h. w., Apr. 20, 61.17. | |
| 1875, l. w., Jan. 1, 22.57; h. w., Apr. 25, 57.42. | |
| 1876, l. w., Dec. 31, 18.47; h. w., May 15, 59.42. | |
| 1877, l. w., Jan. 9, 16.97; h. w., May 30, 56.27. | |
| 1878, l. w., Nov. 8, 21.92; h. w., Mar. 28, 54.77. | |
| 1879, l. w., Oct. 18-22, 17.37; h. w., Feb. 17-20, 52.37. | |
| 1880, l. w., Oct. 28, 22.87; h. w., Apr. 16, 59.07. | |
| 1881, l. w., Sept. 21, 20.27; h. w., Mar. 16 and 19, 56.37. | |
| 1882, l. w., Nov. 6-9, 25.27; h. w., Mar. 28, 63.32. | |
| 1883, l. w., Oct. 6, 20.47; h. w., Apr. 8, 59.57. | |
| 1884, l. w., Dec. 16, 23.37; h. w., Mar. 25, 62.97. | |
| 1885, l. w., Oct. 27, 22.07; h. w., May 13, 56.77. | |
| 1886, l. w., Nov. 8, 18.37; h. w., May 10, 59.32. | |
| 1887, l. w., Nov. 25, 16.92; h. w., Mar. 31, 59.77. | |
| Mouth of the Red River and head of the Atchafalaya River, Red River Landing, La., zero of gauge..... | 2.59 |
| Extreme low and high water, 1872 to 1886 (range 48.50 feet) | 2.59-51.09 |
| The lowest and highest stages of the river here during the years 1872 to 1886 were as follows: | |
| 1872, l. w., Dec. 15, 2.59; h. w., May 6, 42.01. | |
| 1873, l. w., Oct. 25, 4.84; h. w., June 12, 41.61. | |
| 1874, l. w., Nov. 22, 4.49; h. w., Apr. 16, 49.59. | |
| 1875, l. w., Jan. 1, 8.59; h. w., May 3, 43.04. | |
| 1876, l. w., Dec. 30, 4.84; h. w., May 15, 48.00. | |
| 1877, l. w., Jan. 8 and 10, 3.44; h. w., June 2, 43.14. | |
| 1878, records lacking. | |
| 1879, l. w., Oct. 24, 3.14; h. w., Feb. 19, 38.49. | |
| 1880, l. w., Oct. 26, 8.69; h. w., Apr. 23, 46.64. | |
| 1881, l. w., Sept. 21, 5.99; h. w., Apr. 6-9, 42.69. | |
| 1882, l. w., Oct. 18, 11.69; h. w., Mar. 27, 51.09. | |
| 1883, l. w., Oct. 7, 6.54; h. w., Apr. 9, 47.79. | |
| 1884, l. w., Oct. 1, 8.89; h. w., Mar. 30, 49.89. | |

Feet above the sea.

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|---|-------------|
| 1885, l. w., Oct. 26, 9.29; h. w., Feb. 5, 44.55. | |
| 1886, l. w., Nov. 20, 5.34; h. w., May 31, 44.53. | |
| At Port Hickey, La., zero of gauge (below mean tide)..... | —7.58 |
| Extreme low and high water, 1881 to 1884 (range 38.40 feet)..... | 1.92-40.32 |
| The lowest and highest stages of the river here during the years 1881 to 1884 were as follows: | |
| 1881, l. w., Sept. 11, 1.92; h. w., Apr. 6, 33.22. | |
| 1882, l. w., not recorded; h. w., Mar. 28, 40.32. | |
| 1883, l. w., not recorded; h. w., Apr. 9, 38.52. | |
| 1884, l. w., Dec. 3, 5.54; h. w., Mar. 29, 39.84. | |
| At Baton Rouge, La., zero of gauge..... | —1.20 |
| Extreme low and high water, 1872 to 1886 (range 35.30 feet)..... | —0.30-35.00 |
| The lowest and highest stages of the river here during the years 1872 to 1886 were as follows: | |
| 1872, l. w., Dec. 22, —0.05; h. w., May 7, 28.45. | |
| 1873, l. w., Jan. 1, 1.12; h. w., June 17, 28.65. | |
| 1874, l. w., Nov. 21, 1.10; h. w., Apr. 16, 34.95. | |
| 1875, l. w., Jan. 1, 2.75; h. w., May 13, 28.55. | |
| 1876, l. w., Dec. 30, 0.50; h. w., May 8 and 15, 32.20. | |
| 1877, l. w., Jan. 9, —0.30; h. w., June 1 and 4, 28.45. | |
| 1878, l. w., Nov. 6, 2.10; h. w., Apr. 1, 26.95. | |
| 1879, l. w., Nov. 21-24, 0.80; h. w., Feb. 16, 24.90. | |
| 1880, l. w., Oct. 14 and 25, 2.80; h. w., Apr. 23, 32.00. | |
| 1881, l. w., Sept. 22, 1.70; h. w., Apr. 8, 28.85. | |
| 1882, l. w., Oct. 18, 4.98; h. w., Mar. 26, 34.75. | |
| 1883, l. w., Oct. 7, 1.90; h. w., Apr. 9, 33.88. | |
| 1884, l. w., Dec. 1, 4.05; h. w., Mar. 24, 35.00. | |
| 1885, l. w., Oct. 31, 3.45; h. w., May 11-16, 28.95. | |
| 1886, l. w., Nov. 20, 1.15; h. w., June 1, 30.90. | |
| At Plaquemine, La., zero of gauge..... | —0.20 |
| Extreme low and high water, 1881 to 1884 (range 30.12 feet)..... | 1.28-31.40 |
| The lowest and highest stages of the river here during the years 1881 to 1884 were as follows: | |
| 1881, l. w., Sept. 6 and 10-13, 1.60; h. w., Apr. 3-9, 25.80. | |
| 1882, l. w., Oct. 15-18 and Nov. 10, 3.60; h. w., Mar. 21-27, 31.10. | |
| 1883, l. w., Oct. 7, 1.28; h. w., Apr. 9, 30.53. | |
| 1884, l. w., Oct. 1, 2.70; h. w., Mar. 24, 31.40. | |
| At College Point, La., zero of gauge..... | —0.02 |
| Extreme low and high water, 1880 to 1884 (range 22.73 feet)..... | 1.30-24.03 |
| The lowest and highest stages of the river here during the years 1880 to 1884 were as follows: | |
| 1880, l. w., Nov. 2, 2.63; h. w., Apr. 21, 21.28. | |
| 1881, l. w., Aug. 27 and Sept. 19, 1.33; h. w., May 23, 19.45. | |
| 1882, l. w., Oct. 13 and Nov. 7, 2.46; h. w., Mar. 22, 23.10. | |
| 1883, l. w., Oct. 13, 1.43; h. w., Apr. 9, 23.38. | |
| 1884, l. w., Dec. 2, 1.30; h. w., Mar. 24, 24.03. | |
| At Carrollton, La., zero of gauge..... | —0.35 |
| Extreme low and high water, 1872 to 1887 (range 17.55 feet)..... | —1.95-15.60 |
| The lowest and highest stages of the river here during the years 1872 to 1887 were as follows: | |
| 1872, l. w., Dec. 27, —1.95; h. w., May 6, 11.95. | |
| 1873, l. w., Nov. 20, —0.27; h. w., June 3, 12.58. | |
| 1874, l. w., Nov. 7, —0.15; h. w., Apr. 15, 15.60. | |
| 1875, l. w., Nov. 13, —0.25; h. w., May 4 and 15, 10.95. | |
| 1876, l. w., Dec. 30, —1.55; h. w., May 11, 12.35. | |
| 1877, l. w., Jan. 9, —1.75; h. w., June 8, 10.75. | |
| (Dec. 17, 1876, to Jan. 24, 1877, the river ranged from —0.15 to —1.75 below mean sea level.) | |
| 1878, l. w., Nov. 22, —0.45; h. w., Mar. 21, 10.95. | |
| 1879, l. w., Nov. 24, —1.15; h. w., Feb. 20 and 22, 10.45. | |
| 1880, l. w., Nov. 2, —0.05; h. w., Apr. 23, 13.90. | |
| 1881, l. w., Sept. 10, —0.05; h. w., Apr. 12, 12.20. | |
| 1882, l. w., Nov. 8, 0.65; h. w., Mar. 27, 14.60. | |
| 1883, l. w., Oct. 4, 0.25; h. w., Apr. 9, 14.95. | |
| 1884, l. w., Dec. 2 and 5, —0.05; h. w., Mar. 18, 15.25. | |
| 1885, l. w., Oct. 24, 0.55; h. w., Jan. 22, 13.20. | |
| 1886, l. w., Nov. 27, —0.75; h. w., May 31, 13.45. | |

Feet above the sea.

1887, l. w., Sept. 9, —0·80; h. w., Apr. 6, 14.15.

(Oct. 10–13, 1886, a great storm on the Gulf coast caused the river to rise at Carrollton to a maximum (Oct. 12) 3 feet above its normal level, which during 2 weeks preceding and the week following was about 1 foot above mean tide. The same storm caused the river to rise at Baton Rouge nearly 4 feet, from about 2·5 to 6·3 feet above the sea.)

At New Orleans, about 5 miles below Carrollton, and 100 miles above Port Eads, at the mouth of the Mississippi, the stages of the river are nearly the same as at Carrollton. In the Report of the Chief Signal Officer, 1886, p. 168, it is stated that the zero of the gauge at New Orleans (marking the low water of Dec. 30, 1876) is 1·50 feet below sea level, and that the extreme high water of 1874 (to which the city system of leveling is referred) was 14·67 feet above sea level. The range is thus about 1 foot less than at Carrollton, or approximately 16·50 feet.

Depth of the Mississippi River at New Orleans, 80 to 208 feet.

A letter from D. M. Brosnan, city surveyor of New Orleans, Apr. 2, 1888, contains the following notes from leveling:

| | |
|---|--------|
| Mean sea level..... | 0·00 |
| Lowest water in Lake Pontchartrain | —1·65 |
| Highest water in Lake Pontchartrain | +4·33 |
| Lowest water in Mississippi River..... | —0·77 |
| Highest water in Mississippi River, 1882..... | +14·83 |
| Highest water in Mississippi River, 1874..... | +14·63 |

"No data are at hand concerning tides in Lake Pontchartrain. The effect of tide at New Orleans in the river is about 3 inches."

RUM RIVER.

| | |
|---|-----------|
| Mille Lacs, mainly 10 to 25 feet deep, at head of Rum River, ordinary stage, 1,251; extreme low and high water..... | 1249–1254 |
| (The maximum depth of Mille Lacs, in its southeast part, is about 100 feet.) | |
| Height of land between Mille Lacs and Snake River, about 2½ miles southeast from the lake on the trail..... | 1299 |
| Rum River at Milaca, 12 miles north of Princeton..... | 1042 |
| Mouth of the West Branch, at Princeton..... | 950 |
| Junction with the Mississippi, Anoka..... | 825 |

ST. CROIX RIVER.

This and the Namekagon, Kettle, and Snake Rivers are from leveling by United States engineers, under the direction of Maj. Charles J. Allen, St. Paul, and from railroad surveys.

Feet above the sea.

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|---|---------------|
| Springs at head of the South Branch of the Bois Brulé River..... | 1068 |
| Springs at head of the St. Croix River..... | 1070 |
| (These springs rise in the same marsh, 600 feet apart, the Bois Brulé River running north, the St. Croix south. An ancient watercourse exists here, about a mile wide, bordered by drift bluffs 75 feet high, with their crests 1,140 to 1,150 feet above the sea. It was the outlet of Lake Superior when the receding ice-sheet on the northeast, acting as a barrier to the present course of outflow, held this lake about 500 feet higher than now.) | |
| Upper St. Croix Lake | 1011 |
| St. Croix River at Gordon..... | 1006 |
| Same, low water, above and below the "Big Dam"..... | 1005 and 1001 |
| Same, at Moose River Rapids..... | 987 |
| Mouth of Namekagon River..... | 912 |
| Mouth of Yellow River..... | 892 |
| Mouth of Clam River..... | 870 |
| Head of Kettle River Rapids (4 miles long, falling 49 feet) | 858 |
| Mouth of Kettle River, west of the "Big Island"..... | 824 |
| Foot of Kettle River Rapids..... | 809 |
| Mouth of Snake River..... | 798 |

| | Feet above the sea. |
|---|---------------------|
| At bridge of the Grantsburg Branch, St. Paul and Duluth Railroad. | 775 |
| At Rush City ferry | 770 |
| Mouth of Sunrise River | 758 |
| Mouth of Trade River | 753 |
| Head of St. Croix Rapids (6 miles long, falling 55 feet) | 742 |
| Mouth of Big Rock Creek | 726 |
| Foot of the St. Croix Rapids, at the lower steamboat landing, Taylor's Falls | 687 |
| At head of Rock Island | 685 |
| At Osceola | 683 |
| At bridge of the Minneapolis, Sault Ste. Marie and Atlantic Railway, bed, 670; low and high water | 680-697 |
| Mouth of Apple River | 672 |
| At bridge of the Wisconsin Central Railroad, bed, 666; ordinary low stage of water, 676; extreme low and high water | 670-689 |
| Lake St. Croix (maximum depth, 25 feet), extreme low and high water, 667-687; ordinary stage | 672 |
| Junction with the Mississippi River at Prescott | 667 |

NAMEKAGON RIVER.

| | |
|--|-----------|
| At railway bridge, 2 miles south of Phipps | 1198 |
| At Stinnett | 1131 |
| At Superior Junction | 1037 |
| Mouth of Totogatic River (before the dam was built on the Namekagon River 1 mile below this point) | 918 |
| At road crossing from Grantsburg to the "Big Dam" of the St. Croix River | 914 |
| Junction with the St. Croix River | 912 |
| Elevations of the Totogatic River, tributary to the Namekagon, are as follows: | |
| Above and below the upper dam, Sec. 12, T. 42, R. 10 | 1242-1237 |
| At bridge of the Chicago, St. Paul, Minneapolis and Omaha Railway. | 1010 |
| White Fish Lake | 1030 |
| At foot of dam in Sec. 13, T. 42, R. 13 | 975 |

KETTLE RIVER.

| | |
|---|------|
| At bridge of the Northern Pacific Railroad | 1287 |
| At Kettle River Station, St. Paul and Duluth Railroad | 1010 |
| At the St. Paul, Minneapolis and Manitoba Railway bridge, near Sandstone, between the Upper and Lower Falls | 955 |
| Junction with the St. Croix River, west of the "Big Island" | 824 |

SNAKE RIVER.

| | |
|--|-----|
| At bridge, 1 mile below the mouth of Knife River | 958 |
| At bridge of the St. Cloud and Hinckley line of the St. Paul, Minneapolis and Manitoba Railway | 945 |
| Mouth of Ann River | 943 |
| At the Brunswick Bridge | 941 |
| At the old court-house, about a mile east of Brunswick | 940 |
| Foot of Millett's Rapids, about 3 miles east of Brunswick | 937 |
| Cross and Pokegama Lakes, as flowed by the Chengwatana dam, and the Snake River along the distance of 16 miles from Millett's Rapids | 937 |
| Floor of first gateway, from south bank of river, Chengwatana dam. | 929 |
| Junction with the St. Croix River | 798 |

CHIPPEWA RIVER AND TRIBUTARIES (WISCONSIN).

[From leveling by United States engineers, under the direction of Maj. C. J. Allen, St. Paul, and from railroad surveys.]

| | Feet above the sea. |
|---------------------------------|---------------------|
| Crooked Lake | 1623 |
| Boulder Lake | 1610 |
| Trout Lake | 1593 |
| Dole Lake | 1578 |
| Big and Little Manitouish Lakes | 1575 |

| | Feet above the sea. |
|--|---------------------|
| Island Lake | 1577 |
| Big Lake | 1594 |
| Round Lake | 1532 |
| Round Lake dam, top of gate and sill of large sluiceway | 1532.7-1528.2 |
| Fence Lake | 1563 |
| Crawling Stone, Long, Pokegama, and Flambeau Lakes, each | 1562 |
| Rest Lake | 1571 |
| Flambeau River at the fork of Manitouish and Bear Creeks | 1552 |
| Same, at mouth of Turtle River | 1525 |
| Same, above and below Muskalonge Falls | 1458-1446 |
| Bridge of Wisconsin Central Railroad, Flambeau | 1463.5 |
| Flambeau River here, low water | 1445 |
| Bridge of Wisconsin Central Railroad, Glidden | 1522.5 |
| Chippewa River here, low and high water | 1509-1516 |
| Same, near center of Sec. 28, T. 41, R. 3 W. | 1442 |
| Bear Lake, enlargement of the Chippewa River | 1433 |
| Chippewa River above and below dam, 1 mile west of Bear Lake .. | 1433-1429 |
| Same, head and foot of Cedar Rapids | 1420-1404 |
| Same, head and foot of Snap Tail Rapids | 1368-1346 |
| On the West Fork of Chippewa River: | |
| Lost and Cross Lakes | 1385 |
| Summer Lake | 1396 |
| Partridge Crop Lake | 1385 |
| Moose Lake | 1362 |
| Water above and below the dam at Moose Lake | 1362-1358 |
| West Fork of Chippewa River at mouth of Tea River | 1353 |
| Chief Lake | 1296 |
| Pokegama Lake | 1290 |
| Pa-kwa-wang Lake | 1286 |
| Hunter's Lake | 1327 |
| Little Chief Lake | 1325 |
| On the Courtes Oreilles River: | |
| Flat Lake | 1320 |
| Sand Lake | 1301 |
| Fish Lake | 1289 |
| Island Lake | 1292 |
| Grindstone Lake | 1288 |
| Lac Courtes Oreilles | 1287 |
| Chippewa River, 1 mile east of Bruce, low and high water | 1062-1076 |
| At bridge of the Chicago, St. Paul, Minneapolis and Omaha Rail- way, Chippewa Falls, low and high water | 843-859 |
| At Chippewa Falls, below the ferry landing | 792 |
| Head and foot of the Upper Dalles | 788-778 |
| Same, of the Lower Dalles | 763-756 |
| At bridge of the Chicago, St. Paul, Minneapolis and Omaha Rail- way, Eau Claire, low and high water | 770-792 |
| Mouth of the Eau Claire River, Eau Claire, low water | 751 |
| Mouth of Red Cedar River, low and high water | 705-728 |
| At Durand, low water | 691 |
| At outlet of Dead Lake, low water | 684 |
| Junction with the Mississippi River, opposite to Read's Landing, low and high water | 663-682 |

CROW WING RIVER.

| | |
|--|------|
| Shell Lake, at head of Shell River, estimated | 1425 |
| Leaf Lakes, at head of Leaf River, estimated | 1340 |
| Leaf River at Bluffton | 1305 |
| Crow Wing River at Motley | 1208 |
| Junction with the Mississippi River at Crow Wing | 1145 |

LONG PRAIRIE RIVER.

| | |
|--|------|
| Lakes Miliona and Ida, also Lakes Andrews, Mary, and Lobster, about | 1400 |
| (The maximum depth of Lake Miliona is about 80 feet.) | |
| Long Prairie River above Mill Lake, 3 miles northwest of Alex- andria | 1348 |

| | Feet above the sea. |
|--|---------------------|
| Lakes Darling, Carlos, and Le Homme Dieu, about | 1330 |
| (The maximum depths of these lakes are respectively about 50, 150, and 75 feet, according to soundings by Rev. C. M. Terry.) | |
| At Long Prairie..... | 1287 |
| At bridge of the St. Paul and Northern Pacific Railroad..... | 1227 |
| Junction with the Crow Wing River, near Motley..... | 1205 |
| At the head of Fish Trap Brook, tributary to the Long Prairie River: | |
| Lake Alexandria, about..... | 1275 |
| Fish Trap Lake..... | 1273 |
| (These lakes are probably 150 feet deep, or more, as reported by lumbermen.) | |

SAUK RIVER.

| | |
|---|-----------|
| Osakis Lake, about | 1310 |
| (The mean depth of this lake is about 25 feet; and its maximum depths in the northeast part, 40-70.—C. M. Terry.) | |
| Sauk River at Little Sauk..... | 1240 |
| A mile below Sauk Center..... | 1213 |
| Two miles west of Melrose..... | 1201 |
| Two miles east of Melrose | 1172 |
| At Richmond | 1083 |
| At Cold Spring, above and below the dam..... | 1062-1075 |
| Four miles from its mouth..... | 1035 |
| Junction with the Mississippi, Sauk Rapids..... | 988 |

CROW RIVER.

| | |
|--|-----------|
| North Fork of Crow River at Lintonville..... | 1207 |
| Same, at bridge of the St. Paul, Minneapolis and Manitoba Railway, 1½ miles west of Paynesville..... | 1166 |
| Same, at bridge of the Minneapolis and Pacific Railway, Paynesville..... | 1142 |
| Same, at bridge of the Minneapolis and Pacific Railway, 3½ miles east of Paynesville..... | 1118 |
| Lake Koronis, about..... | 1105 |
| On the Middle Fork of Crow River: | |
| Nest Lake | 1162 |
| Green Lake (maximum depth, 40 to 50 feet)..... | 1154 |
| On the South Fork of Crow River: | |
| Grass Lake, Little and Big Kandiyohe Lakes, and Lake Lillian, about..... | 1125-1110 |
| (The maximum depths of these lakes are 7 to 12 feet.) | |
| Otter Lake, flowed by the Hutchinson dam, about | 1038 |
| At bridge of the branch of the St. Paul, Minneapolis and Manitoba Railway, Hutchinson | 1026 |
| Mouth of Crane Creek, 2 miles east of Lester Prairie..... | 950 |
| At Mayer..... | 932 |
| Above and below the dam at Watertown..... | 927-920 |
| At Delano | 910 |
| Confluence of the North and South Forks of Crow River..... | 901 |
| Crow River at bridge of the Clearwater Branch, St. Paul, Minneapolis and Manitoba Railway, 5 miles from its mouth..... | 855 |
| Junction with the Mississippi River, Dayton..... | 839 |

CANNON RIVER.

| | |
|---|----------|
| At railroad bridge near Lake Dora..... | 1040 |
| Lakes Tetonka and Sakata, Waterville, low and high water | 996-1002 |
| One mile west of Warsaw | 977 |
| Cannon Lake..... | 972 |
| Mouth of Straight River, Faribault, low and high water..... | 956-962 |
| At Northfield, ordinary stage above the dam..... | 902 |
| At bridge of the St. Paul and Kansas City Railway, Randolph | 846 |
| At Cannon Falls, pond above the lower dam..... | 783 |
| Four miles above Eagle Mills | 732 |
| At Cannon Junction | 677 |
| Junction with the Mississippi River, Red Wing..... | 665 |

ZUMBRO RIVER.

| | Feet above the sea. |
|---|---------------------|
| North Branch at Kenyon | 1071 |
| North Middle Branch at bridge of the Chicago, St. Paul and Kansas City Railway..... | 1156 |
| Same, at Pine Island..... | 984 |
| Same, at Oronoco..... | 958 |
| South Middle Branch at bridge of the Chicago, St. Paul and Kansas City Railway..... | 1174 |
| Same, at bridge of the Chicago and Northwestern Railway branch, New Haven..... | 966 |
| South Branch at College Street Bridge, Rochester | 983 |
| Zumbro River at Midland Junction..... | 682 |
| Junction with the Mississippi River, near Kellogg..... | 657 |

ROOT RIVER.

| | |
|---|------|
| North Branch at High Forest | 1213 |
| Junction of North and South Branches, near Lanesboro, about.... | 780 |
| Junction with the Mississippi River, near La Crosse | 626 |

DES MOINES RIVER.

| | |
|---|-----------|
| Sources in northwestern Murray County, Minnesota..... | 1800-1900 |
| Lake Shetek, about..... | 1475 |
| Two miles north of the north end of Heron Lake, about..... | 1375 |
| Heron Lake..... | 1406 |
| At Windom..... | 1334 |
| Two miles northwest of Jackson | 1300 |
| The following lakes, though near the Des Moines River, are tributary to the Little Sioux and Missouri Rivers: | |
| Spirit Lake..... | 1395 |
| Okoboji Lakes | 1390 |
| At Estherville..... | 1254 |
| At Emmetsburg, about..... | 1190 |
| Mouth of the East Fork..... | 1047 |
| At Fort Dodge..... | 1000 |
| At Moingona..... | 870 |
| At Des Moines | 776 |
| At Eddyville..... | 698 |
| Junction with the Mississippi River, near Keokuk | 476 |

MINNESOTA RIVER SYSTEM.

[From leveling by United States engineers, under the direction of Gen. G. K. Warren and Maj. C. J. Allen, and from railway surveys.]

MINNESOTA RIVER.

[The elevations refer, unless otherwise noted, to the stage of ordinary low water.]

| | Feet above the sea. |
|---|---------------------|
| At Brown's Valley | 972-5 |
| Big Stone Lake (maximum depths, 15 to 30 feet), low and high water..... | 962-967 |
| Mouth of Pomme de Terre River..... | 935 |
| Lac Qui Parle (maximum depth, 12 feet)..... | 926 |
| Mouth of Chippewa River, Montevideo | 913 |
| Above Granite Falls..... | 908 |
| Below Granite Falls, low and high water | 870-880 |
| Below Minnesota Falls..... | 856 |
| Mouth of Yellow Medicine River..... | 848 |
| Below Patterson's Rapids, at the east side of Swede's Forest..... | 825 |
| Mouth of Redwood River | 818 |
| At Morton, low and high water..... | 814-836 |
| At Fort Ridgely..... | 793 |
| At New Ulm..... | 784 |
| Mouth of the Big Cottonwood River, low and high water..... | 782-807 |
| At Judson | 760 |
| Mouth of the Blue Earth River..... | 758 |

| | Feet above the sea. |
|---|---------------------|
| At Mankato, low and high water..... | 752-778 |
| At the line of Blue Earth and Le Sueur Counties, about..... | 743 |
| At the Winona and St. Peter (Chicago and Northwestern) Railway bridge, low and high water..... | 733-755 |
| At East St. Peter..... | 730 |
| At Traverse des Sioux..... | 726 |
| At Ottawa..... | 723 |
| At Le Sueur, low and high water..... | 717-742 |
| At East Henderson, low and high water..... | 711-738 |
| At Henderson, low and high water..... | 710-737 |
| At Blakely and Faxon, low and high water..... | 700-726 |
| At Belle Plaine, low and high water..... | 695-722 |
| Crest of Little Rapids, low and high water..... | 692-718 |
| Foot of same, low and high water..... | 690-718 |
| At Hamilton, low and high water..... | 689-715 |
| Junction with the Mississippi River at Fort Snelling, low and high water..... | 688-710 |

(The last 30 miles of this river, from Little Rapids to its mouth, are held, at its lowest stage, as almost level backwater by the recent alluvial deposits of the Mississippi. Because of this dam across the mouth of the Minnesota River, its depth at low water along this extent of 30 miles is from 10 to 25 feet, quite uniformly averaging, except at the mouths of tributaries, about 20 feet.)

POMME DE TERRE RIVER.

| | |
|---|------|
| At Parkdale..... | 1226 |
| Lake Christina and Pelican Lake, about..... | 1215 |
| At bridge of the St. Paul, Minneapolis and Manitoba Railway line, from Evansville to Tintah, 1 mile south of Pomme de Terre Lake.. | 1160 |
| At bridge of the Minneapolis and Pacific Railway..... | 1147 |
| One and one-half miles east of Morris, bed..... | 1074 |
| Three miles farther south..... | 1068 |
| At railway bridge 2 miles northeast of Appleton..... | 1005 |
| At Appleton (St. Paul, Minneapolis and Manitoba Railway bridge). | 983 |
| Same (Chicago, Milwaukee and St. Paul Railway bridge)..... | 978 |
| Junction with the Minnesota River..... | 935 |

CHIPPEWA RIVER (MINNESOTA).

| | |
|---|-----------|
| Two miles southeast of Evansville..... | 1339 |
| At bridge of the Minneapolis and Pacific Railway..... | 1184 |
| At Cyrus..... | 1110 |
| Lake Reno (20 feet deep), about..... | 1400 |
| Lake Whipple (maximum depth, 85 feet), low and high water..... | 1133-1137 |
| Lake Emily, about..... | 1080 |
| Lakes Villard and Amelia..... | 1347 |
| East Branch of the Chippewa River, at bridge of the Minneapolis and Pacific Railway..... | 1307 |
| Lake Johanna, about..... | 1200 |
| Mouth of the East Branch, about..... | 1025 |
| At Benson..... | 1022 |
| Junction with the Minnesota River, Montevideo..... | 913 |

LAC QUI PARLE RIVER.

| | |
|--|------|
| West Branch, at Dawson..... | 1029 |
| Confluence of the West and East Branches, about..... | 1025 |
| Lake Hendricks, tributary at its highest stage to the East Branch, about..... | 1750 |
| Junction with the Minnesota River..... | 925 |

YELLOW MEDICINE RIVER.

| | |
|--|------|
| Lake Shaokatan, tributary at its highest stage to this river, about. | 1750 |
| Yellow Medicine River, at Hanley Falls..... | 1017 |
| Junction with the Minnesota River..... | 848 |

REDWOOD RIVER.

| | |
|-------------------------|------|
| Lake Benton..... | 1754 |
| At Marshall, about..... | 1155 |

| | Feet above the sea. |
|--|---------------------|
| Head of series of falls at Redwood Falls | 953 |
| Foot of same, about..... | 850 |
| At bridge of the Minneapolis and St. Louis Railway | 831 |
| Junction with the Minnesota River..... | 818 |

COTTONWOOD RIVER.

| | |
|---|------|
| Sources near Balaton, about | 1500 |
| At line between Lyon and Redwood Counties, about | 1120 |
| At line between Redwood and Brown Counties, about | 1030 |
| At Iberia, about..... | 900 |
| Junction with the Minnesota River..... | 782 |

BLUE EARTH RIVER.

| | |
|--|------|
| Union Slough, Iowa, at head of the most southern branch of the Blue Earth River, formerly the channel of a river flowing to the East Fork of the Des Moines from the glacial Lake Minnesota in the Blue Earth and Minnesota Basins, about..... | 1150 |
| At Blue Earth City..... | 1049 |
| Two miles southwest of Winnebago City..... | 1022 |
| At Vernon Center and Edgewood..... | 941 |
| Junction with the Minnesota River near Mankato..... | 756 |

LE SUEUR RIVER.

| | |
|--|------|
| In Sec. 32, Otisco, Le Sueur County..... | 1117 |
| Lake Elysian, about | 1040 |
| At line between Waseca and Blue Earth Counties, about | 1010 |
| At railroad bridge, 1 mile south from the junction of the Le Sueur with the Blue Earth River | 780 |

MISSOURI RIVER SYSTEM.

[From the Missouri River Commission, and from railroad surveys.]

MISSOURI RIVER.

[From leveling and gauge records of the Missouri River Commission in report on Stages of the Missouri River from St. Charles, Mo., to Fort Pierre, Dak., 1886 (therein referred to the St. Louis directrix), and from railroad surveys.]

| | Feet above the sea. |
|---|---------------------|
| Junction of the Jefferson, Madison, and Gallatin Rivers, forming the Missouri River, at Gallatin, Mont., very nearly | 4000 |
| At Townsend, Mont., low water..... | 3793 |
| Mouth of Sunrise River, low and high water..... | 3299-3306 |
| At Great Falls, St. Paul, Minneapolis and Manitoba Railway bridge, head of succession of falls extending 18 miles, reported to amount in total to 512 feet, low and high water..... | 3295-3302 |
| Mouth of Portage River (Highwood Creek), foot of this series of falls and of portage 18 miles long..... | 2783 |
| At Fort Benton, ordinary low water, about..... | 2565 |
| Mouth of Marias River, low and high water, about..... | 2545-2560 |
| Mouth of Milk River, low and high water, about..... | 2020-2040 |
| Mouth of Poplar River, low and high water..... | 1935-1952 |
| Mouth of the Yellowstone River, at Fort Buford, low and high water, about..... | 1855-1875 |
| At Williston, 1 mile above the mouth of Little Muddy Creek (North Dakota), low and high water..... | 1825-1848 |
| Mouth of the Little Missouri River, about..... | 1740 |
| At Bismarck, N. Dak., low water, 1,618; ordinary high water, 1,633; extreme high water, Mar. 31, 1881, and Mar. 19-24, 1887, 1,646..... | 1618-1646 |
| Mouth of the Cheyenne River, about..... | 1460 |
| At Fort Pierre, S. Dak. (gauge at mouth of Bad River), low water [about 1 foot above extreme low water], Nov. 29, 1882..... | 1413-80 |
| [At Pierre (opposite to Fort Pierre), extreme low and high water, according to the survey of the Chicago and Northwestern Railway | 1426-1445] |
| At Chamberlain, S. Dak., low water, Nov. 30, 1882, 1,324-30; extreme low water..... | 1323 |
| At Bijou Hills, S. Dak., low water, Nov. 30, 1882..... | 1281-10 |

| | Feet above the sea. |
|--|---------------------|
| At Fort Randall, S. Dak., low water, Nov. 26, 1881, 1,236·30; Dec. 2, 1882 | 1235·90 |
| Mouth of the Niobrara River, extreme low water, about | 1205 |
| At Running Water, S. Dak., low water, Nov. 18-30, 1881, 1,203·50; extreme low water, about | 1202·50 |
| At Yankton, S. Dak., low water, Nov. 24, 1881 | 1160·76 |
| From notes furnished by E. D. Palmer, city engineer, and from railway profiles, the following elevations in Yankton are obtained: | |
| Chicago and Northwestern depot | 1206 |
| Chicago, Milwaukee and St. Paul depot | 1196 |
| Missouri River, extreme low water, about 1,157; extreme high water, April, 1881, 1,198 | 1157-1198 |
| (This maximum range of 41 feet, considerably exceeding that of other portions of the river above and below Yankton, is caused by the accumulation of gorged ice during the spring flood at the bend 8 miles farther east, just below the mouth of the James River. Mr. Palmer states that the ice of the Missouri seldom or never breaks up in spring without becoming gorged at that sharp bend, raising the flood at Yankton above its normal height.) | |
| Mouth of the James or Dakota River, extreme low and high water, about | 1150-1195 |
| At Vermilion, S. Dak., low water, Nov. 22, 1880, 1,131·00; high water, Mar. 26, 1881, 1,143·60 | 1131-1143·60 |
| (Because of a cut-off made by the Missouri River during the unusually high flood of the spring of 1881, this station was left about 3 miles from its present channel, the mouth of the Vermilion River being thus changed from Vermilion to near Butler's Landing.) | |
| At Butler's Landing, about 5 miles south of Vermilion, S. Dak., low water, Dec. 24, 1881, 1,125·60; high water, Apr. 27, 1881, 1,136·00 .. | 1125·60-1136 |
| Mouth of the Big Sioux River, extreme low and high water, about .. | 1080-1102 |
| At Sioux City, Iowa, extreme low and high water, 1879 to 1885 (range, 22·50 feet) | 1076·50-1099 |
| The lowest and highest stages of the river here during the years 1879 to 1885 were as follows: | |
| 1879, l. w., Dec. 5, 1078·30; h. w., Apr. 7, 1092. | |
| 1880, l. w., Jan. 1, 15, and 26, 1079·40; h. w., July 7 and 19, 1090·50. | |
| 1881, l. w., Dec. 6, 1077·50; h. w., Apr. 23, 1099. | |
| 1882, l. w., Dec. 4, 1076·50; h. w., June 27, 1089·90. | |
| 1883, l. w., Dec. 6, 1076·80; h. w., July 9, 1090. | |
| 1884, l. w., Jan. 1, 1078·10; h. w., Apr. 4, 1092·40. | |
| 1885, l. w., Dec. 16, 1081·51; h. w., June 15, 1091·68. | |
| At Decatur, Nebr., range, 18·50 feet; low water, Nov. 20-26, 1881, 1032·70; high water, Apr. 25, 1881, 1051·20 | 1032·70-1051·20 |
| At Blair, Nebr. (gauge at old transfer landing), range, 20·70 feet; low water, Nov. 23, 1880, 986·10; high water, Apr. 24, 1881, 1006·80 | 986·10-1006·80 |
| At Omaha, Nebr., extreme low and high water, 1873 to 1885 (range, 22·10 feet) | 960·30-982·40 |
| The lowest and highest stages of the river here during the years 1873 to 1885 were as follows: | |
| 1873, l. w., Dec. 2, 960·30; h. w., July 4, 974·80. | |
| 1874, l. w., Nov. 21, 960·90; h. w., June 15-18, 971·40. | |
| 1875, l. w., Nov. 1, 960·60; h. w., Apr. 28, 976·60. | |
| 1876, l. w., Nov. 20, 960·60; h. w., June 21, 973·60. | |
| 1877, l. w., Dec. 20, 962·70; h. w., June 13, 975·90. | |
| 1878, l. w., Jan. 4, 963·50; h. w., June 25, 976·40. | |
| 1879, l. w., Nov. 30, 963·10; h. w., June 28, 975·80. | |
| 1880, l. w., Jan. 27, 962·70; h. w., July 1, 975·10. | |
| 1881, l. w., Nov. 25, 962·60; h. w., Apr. 24, 982·40. | |
| 1882, l. w., Dec. 6, 961·40; h. w., June 28, 973·20. | |
| 1883, l. w., Dec. 20, 961·50; h. w., July 11, 972·80. | |
| 1884, l. w., Dec. 15, 962·80; h. w., Apr. 6, 975·60. | |
| 1885, l. w., Dec. 8, 961·63; h. w., June 17, 974·06. | |
| Mouth of the Platte River, extreme low and high water, about | 941-961 |
| At Plattsmouth, Nebr., extreme low and high water, 1873 to 1885 (range, 20·50 feet) | 939·60-960·10 |

Feet above the sea.

The lowest and highest stages of the river here during the years 1873 to 1885 were as follows:

- 1873, l. w., Dec. 6, 940·80; h. w., July 3, 957·30.
 1874, l. w., Nov. 25 and Dec. 19, 940·10; h. w., June 16, 953.
 1875, l. w., Nov. 22, 940·10; h. w., Apr. 28, 954·10.
 1876, l. w., Feb. 1 and Mar. 2, 940·60; h. w., June 21 and July 4, 952·80.
 1877, l. w., Mar. 9, 940·20; h. w., June 13, 954·70.
 1878, l. w., Jan. 8, 940·10; h. w., June 25, 954·90.
 1879, l. w., Dec. 9 and 12, 941·20; h. w., June 27, 953·20.
 1880, l. w., Mar. 15, 939·60; h. w., July 8, 953·90.
 1881, l. w., Nov. 25, 943·30; h. w., Apr. 25, 960·10.
 1882, l. w., Feb. 22, 940·60; h. w., June 29, 953·90.
 1883, l. w., Dec. 25, 940·10; h. w., June 28, 954·60.
 1884, l. w., Dec. 20, 942·50; h. w., Apr. 6, 954·60.
 1885, l. w., Dec. 9, 941·86; h. w., June 17, 955·06.

At Nebraska City, Nebr., extreme low and high water, 1879 to 1885 (range, 14·60 feet).....

907·50-922·10

The lowest and highest stages of the river here during the years 1879 to 1885 were as follows:

- 1879, l. w., Dec. 11, 907·70; h. w., June 28, 919·70.
 1880, l. w., Jan. 29 and Mar. 1, 908·90; h. w., July 9, 918·10.
 1881, l. w., Dec. 17, 909·60; h. w., Apr. 27, 922·10.
 1882, l. w., Jan. 4, 907·50; h. w., June 30, 918·30.
 1883, l. w., Dec. 1, 908·70; h. w., June 28, 919·70.
 1884, l. w., Dec. 16, 908; h. w., Apr. 7, 920·80.
 1885, l. w., Dec. 10, 907·86; h. w., June 17, 920·06.

At Brownsville, Nebr., extreme low and high water, 1881 to 1885 (range, 19·50 feet).....

875·10-894·60

The lowest and highest stages of the river here during the years 1881 to 1885 were as follows:

- 1881, l. w., Nov. 25, 878·70; h. w., Apr. 26, 894·60.
 1882, l. w., Dec. 9, 875·10; h. w., June 30, 890·40.
 1883, l. w., Dec. 29, 877·60; h. w., June 24, 891·10.
 1884, l. w., Dec. 18, 877; h. w., Apr. 8, 891·60.
 1885, l. w., Dec. 8, 879·03; h. w., June 17, 890·23.

At White Cloud, Kans., extreme low and high water, 1881 to 1885 (range, 22·81 feet).....

828·70-851·51

The lowest and highest stages of the river here during the years 1881 to 1885 were as follows:

- 1881, l. w., Dec. 31, 832·70; h. w., Apr. 28, 851·51.
 1882, l. w., Dec. 6, 832; h. w., July 1, 847·40.
 1883, l. w., Dec. 21, 831·20; h. w., June 24, 849·60.
 1884, l. w., Dec. 18, 828·70; h. w., June 23, 848·70.
 1885, l. w., Dec. 10, 830·18; h. w., June 17, 848·26.

At St. Joseph, Mo., extreme low and high water, 1872 to 1885 (range, 26 feet).....

790-816

The lowest and highest stages of the river here during the years 1872 to 1885 were as follows:

- 1872, l. w., Nov. 29, 790·20; h. w., June 26-29 and July 3, 804·70.
 1873, l. w., Dec. 9-12, 790; h. w., July 5, 809.
 1874, l. w., Jan. 6, 791·20; h. w., June 17, 805·80.
 1875, l. w., Jan. 2, 792; h. w., Apr. 29, 808·50.
 1876, l. w., Feb. 6, 792·70; h. w., July 5, 807·80.
 1877, l. w., Dec. 1, 795·40; h. w., June 14, 809·90.
 1878, l. w., Dec. 22, 793·70; h. w., July 2, 810·60.
 1879, l. w., Dec. 17, 791·50; h. w., June 30, 808·60.
 1880, l. w., Nov. 28, 793·30; h. w., July 10, 807·90.
 1881, l. w., Nov. 23 and Dec. 31, 796; h. w., Apr. 29, 816.
 1882, l. w., Dec. 13, 790·20; h. w., June 30 and July 2, 809.
 1883, l. w., Dec. 26, 791·20; h. w., June 26, 811·60.
 1884, l. w., Jan. 1, 791·80; h. w., Apr. 7, 808·30.
 1885, l. w., Dec. 23, 794·86; h. w., June 18, 808.

At Atchison, Kans., extreme low and high water, 1879 to 1885 (range, 24·20 feet).....

765-789·20

The lowest and highest stages of the river here during the years 1879 to 1885 were as follows:

- 1879, l. w., Feb. 11, 769·10; h. w., June 30, 782·50.

Feet above the sea.

| | |
|--|---------------|
| 1880, l. w., Nov. 27, 765·80; h. w., July 10, 781·90. | |
| 1881, l. w., Nov. 26, 767·80; h. w., Apr. 29, 789·20. | |
| 1882, l. w., Dec. 9-12, 765·60; h. w., July 2, 781·80. | |
| 1883, l. w., Dec. 30, 765; h. w., June 26, 784·10. | |
| 1884, l. w., Jan. 1, 765·30; h. w., Apr. 9, 782. | |
| 1885, l. w., Dec. 24, 767·36; h. w., June 18, 782·01. | |
| At Fort Leavenworth, Kans., extreme low and high water, 1872 to 1881 (range, 26·20 feet) | 743·28-769·48 |
| The lowest and highest recorded stages of the river here during the years 1872 to 1881 were as follows: | |
| 1872, l. w., Dec. 4, 744·12; h. w., July 14, 759·12. | |
| 1873, l. w., Dec. 10, 744·53; h. w., July 5, 761·80. | |
| 1874, l. w., Jan. 6, 744·36; h. w., June 19, 758·63. | |
| 1875, l. w., Jan. 1, 744·73; h. w., Apr. 30, 760·43. | |
| 1876, l. w., Dec. 6, 744·78; h. w., July 6, 759·43. | |
| 1877, l. w., Dec. 2, 746·43; h. w., June 13, 761·93. | |
| (The low water of Dec. 18, 1877, was not recorded.) | |
| 1878, l. w., Jan. 10, 745·13; h. w., July 2, 761·68. | |
| 1879, l. w., Dec. 18, 745·48; h. w., June 30, 759·53. | |
| 1880, l. w., Nov. 26, 743·28; h. w., July 11, 759·23. | |
| (The record at Leavenworth does not note the stage of unusually low water Nov. 26, 1880.) | |
| 1881, l. w., Feb. 5, 748·43; h. w., Apr. 29, 769·48. | |
| At Leavenworth, Kans., extreme low and high water, 1873 to 1885 (range, 23·80 feet) | 741·80-765·60 |
| The lowest and highest recorded stages of the river here during the years 1873 to 1885 were as follows: | |
| 1873, l. w., Dec. 9, 741·40; h. w., July 5, 759·60. | |
| 1874, l. w., Jan. 6, 741·80; h. w., June 17, 756·30. | |
| 1875, l. w., Jan. 1, 743; h. w., Apr. 29, 757·80. | |
| 1876, l. w., Jan. 26 and 30, 744·80; h. w., July 6, 757·30. | |
| (The low water of Dec. 6, 1876, was not recorded.) | |
| 1877, l. w., Dec. 18, 744·70; h. w., June 13, 760·50. | |
| 1878, l. w., Jan. 10, 744·40; h. w., July 2, 759·30. | |
| 1879, l. w., Mar. 1, 744·20; h. w., June 27 and 30, 757·20. | |
| (The low water of Dec. 18, 1879, was not recorded.) | |
| 1880, l. w., Feb. 3 and 8, 743·60; h. w., July 15, 756·80. | |
| 1881, l. w., Jan. 1, 745·80; h. w., Apr. 29, 765·60. | |
| 1882, l. w., Dec. 15, 742·20; h. w., July 2, 758·90. | |
| 1883, l. w., Dec. 26, 743·30; h. w., June 26, 762·30. | |
| 1884, l. w., Dec. 29, 745·40; h. w., June 24, 758·70. | |
| 1885, l. w., Dec. 10, 744·86; h. w., June 19, 759·24. | |
| Mouth of the Kansas River, extreme low and high water, about ... | 718-745 |
| At Kansas City, Mo., extreme low and high water, 1873 to 1885 (range, 27·55 feet) | 716·18-743·73 |
| [Same, high water, 1844 (36 feet above extreme low water), 752, according to Gannett's Dictionary of Altitudes.] | |
| The lowest and highest stages of the river here during the years 1873 to 1885 were as follows: | |
| 1873, l. w., Dec. 30, 719·20; h. w., June 25 and July 5, 735·70. | |
| 1874, l. w., Jan. 6, 716·70; h. w., June 18, 732·60. | |
| 1875, l. w., Jan. 2, 718·45; h. w., Apr. 30, 734·28. | |
| 1876, l. w., Dec. 9, 718·77; h. w., Apr. 17 and June 14, 733·87. | |
| 1877, l. w., Dec. 17, 720·56; h. w., June 10, 738·62. | |
| 1878, l. w., Jan. 12, 720·24; h. w., July 2, 736·24. | |
| 1879, l. w., Feb. 28, 719·51; h. w., June 30, 735·43. | |
| 1880, l. w., Nov. 25, 718·03; h. w., July 12-15, 733·03. | |
| 1881, l. w., Feb. 21, 720·78; h. w., Apr. 30, 743·73. | |
| 1882, l. w., Feb. 24, 717·63; h. w., July 3, 736·38. | |
| 1883, l. w., Dec. 31, 717·01; h. w., June 26, 740·46. | |
| 1884, l. w., Jan. 1, 716·18; h. w., June 24, 735·31. | |
| 1885, l. w., Dec. 9, 718·66; h. w., June 19, 735·60. | |
| At Missouri City, Mo., low water, Dec. 25, 1878, 694·80; high water, June 30, 1879, 712·85 | 694·80-712·85 |
| At Camden, Mo., low water, Dec. 21-24, 1878, 678·50; high water, June 30, 1879, 693·50 | 678·50-693·50 |
| At Lexington, Mo., extreme low and high water, 1873 to 1885 (range, 25·20 feet) | 664·10-689·30 |

Feet above the sea.

The lowest and highest stages of the river here during the years 1873 to 1885 were as follows:

1873, l. w., Nov. 19-22, 668·60; h. w., July 7, 682·20.
 1874, l. w., Dec. 31, 666·60; h. w., June 19, 679·20.
 1875, l. w., January, 666·30; h. w., May 1, 680·80.
 1876, l. w., Jan. 17 and Feb. 2-7, also Dec. 6-12 and 26-31, 667·30;
 h. w., June 16, 681·10.

1877, l. w., Jan. 1-28, 667·30; h. w., June 11, 684·60.

1878, l. w., Dec. 28, 668·90; h. w., July 4, 683·70.

1879, l. w., Dec. 20, 667·60; h. w., June 30, 682·70.

1880, l. w., Dec. 30, 666·70; h. w., Apr. 9, 679·20.

1881, l. w., Feb. 4, 667; h. w., May 1, 689·30.

1882, l. w., Dec. 12, 664·10; h. w., July 3, 680·90.

1883, l. w., Jan. 3, 664·70; h. w., June 27, 685·80.

1884, l. w., Jan. 2, 665·60; h. w., Apr. 10, 680·90.

1885, l. w., Dec. 18, 665·03; h. w., Mar. 8, 685·91.

At Waverly, Mo., low and high water, 1878 and 1883 to 1885 (range, 24·06 feet)

645-669·06

Recorded stages of low and high water here were as follows:

1878, l. w., Dec. 21, 645; 1879, h. w., June 30, 660·70.

1883, l. w., Jan. 3, 645·31; h. w., June 27, 665·11.

1884, l. w., Dec. 25, 647·51; h. w., June 25, 661·71.

1885, l. w., Dec. 17, 646·41; h. w., Mar. 13, 669·06.

At Miami, Mo., low water, Feb. 11, 1879, 622·41; high water, June 28 and July 1, 1879, 640·21

622·41-640·21

At De Witt, Mo., low and high water, 1883 to 1885 (range, 23·20 feet)

613·61-636·81

The lowest and highest stages of the river here during the years 1883 to 1885 were as follows:

1883, l. w., Jan. 6 and Dec. 31, 616·41; h. w., June 27, 636·81.

1884, l. w., Dec. 20, 613·61; h. w., Apr. 10, 632·41.

1885, l. w., Dec. 15, 616·31; h. w., June 20, 633·13.

At New Frankfort, Mo., low water, Mar. 3, 1879, 602·48; high water, July 1, 1879, 615·53

602·48-615·53

At Glasgow, Mo., extreme low and high water, 1879 to 1885 (range, 24·91 feet)

590·56-615·47

The lowest and highest stages of the river here during the years 1879 to 1885 were as follows:

1879, l. w., Dec. 20, 590·56; h. w., July 1, 607·72.

1880, l. w., Mar. 21, 591·16; h. w., July 13, 604·68.

1881, l. w., Jan. 2, 591·43; h. w., May 3, 614·08.

1882, l. w., Dec. 30, 592·51; h. w., July 2, 611·43.

1883, l. w., Dec. 31, 591·33; h. w., June 23, 615·47.

1884, l. w., Jan. 1, 591·12; h. w., Apr. 10, 607·40.

1885, l. w., Dec. 15, 591·89; h. w., June 22, 609·08.

At Boonville, Mo., extreme low and high water, 1874 to 1885 (range, 23·22 feet)

564·90-588·12

Same, high water, 1844

597·50

The lowest and highest stages of the river here during the years 1874 to 1885 were as follows:

1874, l. w., Dec. 31, 564·90; h. w., June 19, 577·31.

1875, l. w., Jan. 1, 564·90; h. w., July 8, 584·86.

1876, l. w., Feb. 7, 567·53; h. w., May 8, 583·20.

1877, l. w., Jan. 1, 569·61; h. w., June 13, 585·20.

1878, l. w., Dec. 24, 567·50; h. w., July 6, 582·45.

1879, l. w., Feb. 17, 568·20; h. w., July 1, 583·20.

1880, l. w., Dec. 11, 567·95; h. w., July 13, 580·45.

1881, l. w., Jan. and Feb., 570·29; h. w., May 3, 588·12.

1882, l. w., Dec. 18, 566·11; h. w., July 2, 585·69.

1883, l. w., Jan. 7, 566·53; h. w., June 23, 588·10.

1884, l. w., Jan. 9, 569·49; h. w., Apr. 10, 580·59.

1885, l. w., Dec. 18, 568·41; h. w., June 22, 583·41.

At Providence, Mo., low water, Dec. 28, 1878, 545·21; high water, July 1, 1879, 561·31

545·21-561·31

At Jefferson City and Cedar City, Mo., extreme low and high water, 1878 to 1885 (range, 22·66 feet)

523·19-545·85

[Same, high water, July, 1844 (30·83 feet above extreme low water), 554·02, according to Proceedings of the Academy of Science, St. Louis, Transactions, vol. 4, p. xvii.]

Feet above the sea.

Recorded stages of low and high water here from 1878 to 1885 were as follows:

| | |
|--|---------------|
| 1878, l. w., Dec. 20, 523.19. | |
| 1879, l. w., Jan. 11 and Mar. 3, 524.23; h. w., June 28, 538.27. | |
| 1880, l. w., Dec. 31, 524.18. | |
| 1881, l. w., Jan. 1, 524.68; h. w., May 4, 545.85. | |
| 1882, l. w., Dec. 19, 524.72; h. w., July 2, 543.70. | |
| 1883, l. w., Jan. 11, 523.80; h. w., June 23, 545.73. | |
| 1884, l. w., Jan. 3, 523.28; h. w., July 16, 538.91. | |
| 1885, l. w., Dec. 15, 524.36; h. w., June 21, 540.46. | |
| At Fisher's Landing, Mo., low water, Dec. 23, 1878, 502.18; high water, July 2, 1879, 517.23. | 502.18-517.23 |
| At Hermann, Mo., extreme low and high water, 1873 to 1885 (range, 25.33 feet). | 479.92-505.25 |
| The lowest and highest stages of the river here during the years 1873 to 1885 were as follows: | |
| 1873, l. w., Dec. 31, 484; h. w., June 10, 496.67. | |
| 1874, l. w., Jan. 21, 482.92; h. w., June 19, 497.34. | |
| 1875, l. w., Jan. 5, 483.25; h. w., Aug. 1, 502.75. | |
| 1876, l. w., Dec. 9, 484; h. w., July 6, 503.67. | |
| 1877, l. w., Oct. 13, 487.17; h. w., June 13, 503.25. | |
| 1878, l. w., Dec. 21, 479.92; h. w., July 5, 499.25. | |
| 1879, l. w., Dec. 22, 484.09; h. w., June 29, 500.25. | |
| 1880, l. w., Dec. 6, 484.09; h. w., July 15, 497.50. | |
| 1881, l. w., Jan. 28, 486.09; h. w., May 4, 504.50. | |
| 1882, l. w., Dec. 17, 481.42; h. w., July 3, 503.01. | |
| 1883, l. w., Jan. 9, 482.25; h. w., June 24, 505.25. | |
| 1884, l. w., Jan. 4, 484.59; h. w., May 6, 498.92. | |
| 1885, l. w., Jan. 28, 486.71; h. w., June 16, 503.01. | |
| At Washington, Mo., low water, Feb. 21, 1879, 458.01; high water, July 2, 1879, 474.08. | 458.01-474.08 |
| At Cottleville Landing, Mo., low water, Dec. 27, 1878, 437.02; high water, July 3, 1879, 451.86. | 437.02-451.86 |
| At St. Charles, Mo., extreme low and high water, 1879 to 1885 (range, 26.82 feet). | 416.16-442.98 |
| The lowest and highest stages of the river here during the years 1879 to 1885 were as follows: | |
| (1878, l. w., Dec. 25, 416.73.) | |
| 1879, l. w., Dec. 26, 416.16; h. w., July 3, 436.35. | |
| 1880, l. w., Dec. 12, 416.28; h. w., July 14, 432.95. | |
| 1881, l. w., Jan. 1, 418.73; h. w., May 5, 441.39. | |
| 1882, l. w., Dec. 19, 416.36; h. w., July 4, 438.74. | |
| 1883, l. w., Jan. 10, 416.36; h. w., June 24, 442.98. | |
| 1884, l. w., Jan. 4, 416.66; h. w., July 17, 434.41. | |
| 1885, l. w., Dec. 18, 417.71; h. w., June 22, 437.28. | |
| At Jamestown Landing, Mo., about 6 miles above the mouth of the river, low water, Dec. 24, 1878, 403.43; high water, July 3, 1879, 418.14. | 403.43-418.14 |
| Junction with the Mississippi River, extreme low and high water, approximately. | 395-435 |
| (St. Louis directrix, 412.71 feet above mean tide in the Gulf of Mexico at Biloxi, Miss.) | |

MILK RIVER.

[At bridges of the St. Paul, Minneapolis and Manitoba Railway, low water.]

| | |
|---|-----------|
| Three and 3/4 miles west of Yantic, about | 2425 |
| Two miles east of Yantic | 2406 |
| At Malta, low and high water | 2220-2239 |
| Two miles west of Glasgow, about | 2055 |
| Junction with the Missouri River, low and high water, about.... | 2020-2040 |

CHEYENNE RIVER.

| | |
|---|------|
| South Fork at bridge of the Fremont, Elkhorn and Missouri Valley Railroad, Black Hills Branch | 2918 |
| Junction of the North and South Forks (according to Newton and Jenney) | 2470 |
| Junction with the Missouri River, about | 1460 |

JAMES OR DAKOTA RIVER.

| | Feet above the sea. |
|---|---------------------|
| At New Rockford | 1502 |
| Arrow Wood Lake, about | 1440 |
| Jim Lake, about..... | 1435 |
| At Jamestown..... | 1382 |
| At Montpelier | 1334 |
| At Grand Rapids | 1298 |
| At La Moure..... | 1289 |
| Lake Columbia, nearly 30 miles long (also called Sand Lake; the Chedi and Tchan-chicahah Lakes of Nicollet) | 1286 |
| At foot of the Columbia dam | 1276 |
| At bridge of Aberdeen Branch, St. Paul, Minneapolis and Manitoba Railway | 1272 |
| Three miles east of Bath..... | 1269 |
| At Frankfort..... | 1240 |
| At Huron, low and high water..... | 1227-1245 |
| At Forestburg..... | 1213 |
| Month of Firesteel Creek, 3 miles east of Mitchell..... | 1206 |
| At James River Station..... | 1178 |
| At bridge of the Chicago, Milwaukee and St. Paul Railway, 4 miles northeast of Yankton | 1161 |
| Junction with the Missouri River, extreme low and high water, about..... | 1150-1195 |

VERMILION RIVER.

| | |
|--|------|
| West Fork of Vermilion River at Howard..... | 1536 |
| Same, $1\frac{1}{2}$ miles west of Salem..... | 1460 |
| Same, $1\frac{1}{2}$ miles west of Parker..... | 1328 |
| East Fork of Vermilion River, near Winfred | 1625 |
| Same, at Montrose..... | 1458 |
| Junction of the West and East Forks, about..... | 1290 |
| At railroad bridge near Vermilion..... | 1129 |
| Junction with the Missouri River..... | 1125 |

BIG SIOUX RIVER.

| | |
|---|-----------|
| Lake Kampeska..... | 1714 |
| At Watertown | 1709 |
| At Volga | 1596 |
| At Flandreau, above and below the dam..... | 1523-1514 |
| Two miles southwest of Flandreau | 1510 |
| One mile south of Sioux Falls Junction | 1497 |
| Six miles south of Sioux Falls Junction..... | 1479 |
| At Dell Rapids railroad bridge | 1470 |
| Two miles west of Sioux Falls..... | 1406 |
| Sioux Falls, low and high water at head of the falls..... | 1383-1388 |
| Same, low water at foot of the falls..... | 1307 |
| At Brandon, low and high water..... | 1284-1305 |
| Three miles east of Canon | 1228 |
| Month of Rock River, about..... | 1170 |
| At Hawarden..... | 1147 |
| At railway bridge between Westfield and Elk Point..... | 1098 |
| Junction with the Missouri River, near Sioux City, low and high water, about..... | 1080-1102 |

ROCK RIVER.

| | |
|---|-----------|
| Four miles west of Woodstock..... | 1648 |
| Three miles northwest of Edgerton..... | 1567 |
| At Luverne (below the mill)..... | 1428 |
| At bridge of Burlington, Cedar Rapids and Northern Railway, Rock Rapids | 1320 |
| Four and a half miles south of Rock Rapids, low and high water.. | 1299-1314 |
| One mile south of Doon, low and high water..... | 1251-1269 |
| Junction with the Big Sioux River, about..... | 1170 |

STREAMS AND LAKES ON THE CANOE ROUTE FROM LAKE SUPERIOR TO THE LAKE OF THE WOODS, BY WAY OF THE KAMINISTIQUEUA, DOG, STURGEON, AND RAINY RIVERS.

[Determined by leveling by S. J. Dawson in 1857 and 1858, and published in Hind's Narrative of the Canadian Exploring Expeditions, London, 1860, vol. ii, pp. 399-402; corrected approximately by comparison with the survey of the Canadian Pacific Railway.]

| | From Lake Superior. | Above the sea. |
|---|---------------------|----------------|
| | Miles. | Feet. |
| Month of the Kaministiquia River, Lake Superior | 0·0 | 602 |
| Mountain portage (Kakabeka Falls), Kaministiquia River, 248 rods, ascending 119 feet (including 14 feet of rapids below the falls) | 29·2- 30·0 | 631-800 |
| Rocky portage (or Ecarté portage), 148 rods, ascending 63 feet | 30·2- 30·7 | 800-863 |
| (Nine portages, successively 6½, 12½, 7, 19, 10, 3, 3, 3, and 15 feet, intervene between the last and Little Dog Lake.) | | |
| Little Dog Lake, 1·2 miles across on this route | 52·3- 53·5 | 1002 |
| Great Dog portage, 1½ miles, ascending 348 feet to Great Dog Lake | 53·5- 55·2 | 1002-1350 |
| Summit of this portage (a broad and massive sand ridge) .. | 54·0 | 1470 |
| Highest part of this sand ridge, east of the portage path, about | 54·0 | 1500 |
| (“The Great Falls of Little Dog River are surprisingly beautiful. The difference in level between Little and Great Dog Lake . . . is descended by the foaming torrent in six successive leaps.”) | | |
| Great Dog Lake, 90 feet deep, crossed 10½ miles on this route, to the mouth of Dog River | 55·2- 66·0 | 1350 |
| Mouth of Prairie River, tributary to Dog River | 98·8 | 1378 |
| Cold Water Lake, crossed 0·2 mile on this route | 101·9-102·1 | 1381 |
| Prairie portage, 2½ miles, ascending 157 feet, to Height of Land Lake | 102·1-104·6 | 1381-1538 |
| Summit of this portage, about | | 1570 |
| The highest land there within view is about | | 1600 |
| Height of Land Lake, crossed 0·2 mile on this route | 104·6-104·8 | 1538 |
| (The portage from this to Savanne Lake “passes over a low sandy ridge supporting small pine.”) | | |
| Savanne Lake, crossed 1½ miles on the route | 105·4-106·9 | 1522 |
| Great Savanne portage, 1½ miles, descending 32 feet to the Savanne River | 106·9-108·4 | 1522-1490 |
| Thousand Lakes [Lac des Mille Lacs], 21½ miles on the route | 121·6-143·4 | 1485 |
| Same, low and high water, approximately | | 1483-1489 |
| (The Seine River, outflowing from this lake to Rainy Lake, has a total descent of 368 feet, approximately. Hind states that it “falls 350 feet by 29 steps varying in altitude from 3 to 36 feet.”) | | |
| Baril Lake, on the head stream of Sturgeon River, crossed 8 miles on the route | 143·6-151·6 | 1487 |
| Brulé portage, 84 rods, descending 47 feet | 151·6-151·9 | 1487-1440 |
| Upper Brulé Lake (or Cannibals' Lake), 8 miles on the route | 151·9-159·9 | 1440 |
| Lower Brulé Lake, 4½ miles on the route | 159·9-164·1 | 1437 |
| Great French portage, 1½ miles, descending 100 feet to French Portage Lake | 164·1-165·8 | 1437-1337 |
| French Portage Lake, 1½ miles on the route | 165·9-167·4 | 1337 |
| Pickrel Lake, 13 miles on the route | 169·9-182·9 | 1336 |
| Pickrel portage, 104 rods, descending 7 feet to Doré Lake | 182·9-183·2 | 1336-1329 |
| Doré Lake, 1½ miles on the route | 183·2-185·0 | 1329 |
| Deux Rivières portage, 128 rods, descending 117 feet to Sturgeon Lake | 185·0-185·4 | 1329-1212 |
| Sturgeon Lake, 23½ miles on the route | 185·4-208·6 | 1212 |
| First Sturgeon Rapids, descending 4 feet in 44 rods | 208·6-208·7 | 1212-1208 |
| Second Sturgeon Rapids, portage 12 rods, descending 6 feet | 209·0 | 1208-1202 |

STREAMS AND LAKES ON THE CANOE ROUTE, ETC.—Continued.

| | From Lake Superior. | Above the sea. |
|---|---------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Island portage, 12 rods, descending 10 feet | 221.2 | 1197-1187 |
| Nequanquon Lake (or Lac la Croix), 8 miles on the route. | 225-233 | 1186 |
| Rattlesnake portage, Namekan River, 20 rods, descending 12 feet | 235.2-235.3 | 1184-1172 |
| Crow portage, 32 rods, descending 10 feet | 238.6-238.7 | 1171-1161 |
| Grand Falls portage, 24 rods, descending 16 feet | 245.2-245.3 | 1158-1142 |
| Foot of Grand Rapids, Namekan River | 248.8 | 1127 |
| Lake Namekan, 6½ miles on this route | 251.3-257.8 | 1126 |
| Rainy Lake, 38 miles on this route | 263.3-301.3 | 1117 |
| Same, low and high water, approximately | | 1115-1120 |
| Rapids, Rainy River, ¼ mile, descending 3 feet | 301.3-301.8 | 1117-1114 |
| Chaudière Falls, close east of Fort Francis, portage 32 rods, descending 23 feet | 303.3-303.4 | 1114-1091 |
| Manitou Rapids, descending 2½ feet in 60 rods | 336.2-336.4 | 1081-1078½ |
| Long Sault Rapids, descending 3 feet in ¼ mile | 342.9-343.1 | 1075-1072 |
| Lake of the Woods, crossed 72 miles on the route to Lake Winnipeg and the Red River settlements, by way of the Winnipeg River | 381.1-453.1 | 1060 |

SYSTEM OF THE RAINY AND WINNIPEG RIVERS.

LAKES ON THE INTERNATIONAL BOUNDARY, AND RAINY LAKE AND RIVER.

[From barometric observations by Prof. N. H. Winchell and Col. Charles Whittlesey, and from leveling by S. J. Dawson; corrected by comparison with subsequent railway surveys.]

| | Feet above the sea. |
|--|---------------------|
| Watershed between South and North Lakes, on the international boundary | 1573 |
| North Lake | 1535 |
| Gunflint Lake | 1530 |
| Saganaga Lake | 1368 |
| Otter Track Lake | 1326 |
| Knife Lake | 1322 |
| Basswood Lake | 1244 |
| Lac la Croix | 1186 |
| Namekan or Sturgeon Lake | 1126 |
| Rainy Lake, low and high water, approximately, 1115-1120; mean. | 1117 |
| The maximum depth of Rainy Lake, according to Dr. A. C. Lawson, is 110 feet. | |
| Vermilion Lake | 1357 |
| On Rainy River: | |
| Rapids at the mouth of Rainy Lake, about 3 feet | 1117-1114 |
| Falls of Rainy River (Chaudière Falls), at Fort Francis, 2½ miles below the mouth of Rainy Lake, 23 feet | 1114-1091 |
| A canal here, unfinished and perhaps never to be completed, is cut through rock (granitoid gneiss) 800 feet, about 40 feet wide, and was designed to have one lift of 24 feet 8 inches. Its cost to the Canadian Government has been \$250,000. (Blue Book: Northwestern Ontario, its boundaries, resources, and communications. Toronto, 1879.) | |
| Mouth of Little Fork | 1087 |
| Mouth of Big Fork | 1085 |
| Manitou Rapids ("a short pitch over solid rock on the bottom and in both banks," N. Butler) | 1081-1078 |
| Head and foot of Long Sault Rapids, descending probably 7 feet in 1 mile | 1075-1068 |
| Mouth of Rapid or Winter Road River | 1063 |
| Lake of the Woods, low and high water, 1057-1063; mean | 1060 |
| Dr. G. M. Dawson states that this lake has a maximum depth of 84 feet in its northern part, which is called Clearwater Lake. | |

SYSTEM OF THE RAINY AND WINNIPEG RIVERS—Continued.

BIG FORK OF RAINY RIVER.

[From Whittlesey's Report of Explorations in the Mineral Regions of Minnesota, 1866; corrected and referred to sea level approximately by comparison with elevations determined by leveling.]

NOTE.—This stream would be more properly named Bowstring River, which is the translation of its Ojibway name.

| | From mouth of Big Fork (Whittlesey). | Above the sea. |
|---|--|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Bowstring Lake (United States engineers)..... | ..... | 1321 |
| Head of "fall of 6 feet over trappose rock" (estimated by Whittlesey "about 70 feet" above the mouth of the Big Fork) | 82 | 1240 |
| "Rapid of 4 feet fall over hornblende slate" | 75 | 1225 |
| "Fall of 29 feet over gneiss and mica slate" | 45 | 1179-1150 |
| Mouth of the West Branch, "which heads near Red Lake" | 40 | 1140 |
| Junction with Rainy River..... | ..... | 1085 |

WEST BRANCH OF BIG FORK OF RAINY RIVER.

| | Feet above the sea. |
|---|---------------------|
| Highest (east) part of portage from Tamarack or Swamp River (a tributary of Red Lake) to Big Fork, about..... | 1165 |
| West Branch of Big Fork, at east end of this portage, "some 25 or 30 miles by the river and about 15 or 18 miles in a straight line" from its mouth (N. Butler) | 1160 |
| Junction with the Big Fork, about | 1140 |

WINNIPEG RIVER.

[From leveling by S. J. Dawson, in 1857 and 1858, published in Hind's Narrative of the Canadian Exploring Expeditions, London, 1860, vol. 2, pp. 401 and 402; referred to sea level by comparison with the survey of the Canadian Pacific Railway. The difference in elevation between the Lake of the Woods and Lake Winnipeg determined by this survey agrees exactly with that found by the railway survey.]

| | From the Lake of the Woods. | Above the sea. |
|---|--------------------------------|--------------------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Lake of the Woods, low and high water, 1057-1063; mean..... | 0-0 | 1060 |
| Rat portage, 52 rods, descending 16 feet..... | 0-0 | 1060-1044 |
| Les Dalles Rapids, descending 3 feet in $\frac{1}{4}$ mile | 8-25- 8-50 | 1043-1040 |
| Grand Décharge, descending 6 feet in $\frac{1}{4}$ mile | 33-55- 33-8 | 1038-1032 |
| Terre Jaune portage, 20 rods, descending 22 feet..... | 35-7 - 35-8 | 1029-1007 |
| Charette Décharge, descending $3\frac{1}{2}$ feet in 8 rods..... | 36-5 | 1006 $\frac{1}{2}$ -1003 |
| Terre Blanche portage, 40 rods, descending 8 feet..... | 37-5 - 37-6 | 1002 - 994 |
| Cave Rapids, descending $2\frac{1}{2}$ feet in 8 rods..... | 38-0 | 993 $\frac{1}{2}$ - 991 |
| Mouth of English River, approximately..... | 54-0 | 987 |
| De l'Isle portage, 8 rods, descending $3\frac{1}{2}$ feet..... | 57-0 | 986 $\frac{1}{2}$ - 983 |
| Chute à Jacques portage (Jack's Falls), 12 rods, descend- ing 13 feet | 80-1 | 979 - 966 |
| Point des Bois portage, 52 rods, descending $10\frac{1}{2}$ feet..... | 89-7 - 89-9 | 964 $\frac{1}{2}$ - 954 |
| Point aux Chênes portage (the Upper Falls), 20 rods, de- scending 20 feet..... | 90-0 - 90-1 | 954 - 934 |
| Roche Brûlé portage, 12 rods, descending 8 feet..... | 91-1 | 933 - 925 |
| Slave Falls portage, 120 rods, descending 20 feet..... | 95-5 - 95-9 | 924 - 904 |
| Barrier Falls portage, 8 rods, descending 5 feet..... | 102-0 | 902 - 897 |
| Otter Falls, descending 3 feet in 4 rods | 107-0 | 895 - 892 |
| (Seven portages, successively 10, 8, $5\frac{1}{2}$, 8, 3, 8, and $4\frac{1}{2}$ feet, follow.) | | |
| Foot of the seventh portage | 116-2 | 826 |
| Bonnet Lake, $4\frac{1}{2}$ miles across on this route | 127-6 -132-1 | 823 |
| Bonnet portage, 4 rods, descending 7 feet..... | 132-2 | 823 - 816 |
| Cap de Bonnet portage, 16 rods, descending 5 feet..... | 132-85-132-9 | 814 - 809 |

SYSTEM OF THE RAINY AND WINNIPEG RIVERS—Continued.

WINNIPEG RIVER—Continued.

| | From the Lake of the Woods. | Above the sea. |
|--|--------------------------------|----------------|
| | <i>Miles.</i> | <i>Feet.</i> |
| Big Bonnet portage, 200 rods, descending 34 feet..... | 136.2 -136.8 | 805 - 771 |
| Petit Roche portage, 52 rods, descending 8 feet..... | 137.1 -137.3 | 770 - 762 |
| White Mud portage, 60 rods, descending 13 feet..... | 140.7 -140.9 | 758 - 745 |
| Silver Falls (or Lower Falls), two portages, 92 rods, de- scending 22 feet..... | 144.4 -144.7 | 744 - 722 |
| Pine portage, 48 rods, descending 8 feet..... | 150.25-150.4 | 720 - 712 |
| At Fort Alexander..... | 161.4 | 710 |
| Mouth of river, Lake Winnipeg..... | 163.2 | 710 |
| Lake Winnipeg (determined by surveys for the Canadian Pacific Railway), low and high water, approximately | 163.2 | 708 - 713 |

The distance traversed thence on the lake to the mouth of the Red River is 41 miles.

There are thus twenty-seven portages (the two décharges being included) between the Lake of the Woods and Lake Winnipeg.

Total length of canoe route, from Lake Superior, by Kaministiquia, Sturgeon, Rainy, and Winnipeg Rivers, to the mouth of the Red River of the North, 657 miles.

SYSTEM OF THE RED RIVER OF THE NORTH.

[From leveling by United States engineers, under the direction of Maj. Charles J. Allen, of St. Paul; from railroad surveys; and from the U. S. Geological Survey of Lake Agassiz.]

RED RIVER.

| | Feet above the sea. |
|--|---------------------|
| Lakes on the Otter Tail River, in northern and central Becker County (the highest sources of this head stream of the Red River of the North)..... | 1500-1400 |
| Otter Tail River, at Frazee (below the mill)..... | 1360 |
| Same, 4 miles southeast of Frazee..... | 1340 |
| Pine Lakes..... | 1330 |
| Rush Lake..... | 1320 |
| Otter Tail Lake (maximum depth, 40-60 feet)..... | 1315 |
| Star and Dead Lakes, about..... | 1350 |
| Lake Clitherall..... | 1334 |
| The maximum depth in the northeast part of this lake, ac- cording to soundings by Rev. C. M. Terry, is 44 feet, and in its southwest part 32 feet. | |
| East and West Battle Lakes..... | 1328 |
| The maximum depth of the former is about 40 feet, and of the latter 50 feet. | |
| Red River (bed), at the railroad bridge in Sec. 33, Aurdal..... | 1230 |
| Same, at the railroad bridge near the east line of the corporation of Fergus Falls..... | 1193 |
| Upper mill pond of Red River, Fergus Falls, above the Park Roller Mill, water..... | 1195 |
| (This mill has 15 feet head, with fall to 1,180 feet.) | |
| In Fergus Falls, at the bridge of the St. Paul, Minneapolis and Manitoba Railway, second mill pond, water..... | 1178 |
| (Two dams, successively with 12 and 10 feet head, are between the last and the next.) | |
| In Fergus Falls, at bridge of the Northern Pacific, Fergus and Black Hills (Northern Pacific) Railroad, bed, 1147; fourth and lowest mill pond, water..... | 1156 |
| (The total descent of the Red River in 3 miles at Fergus Falls is about 80 feet, from 1,210 to 1,130 feet above the sea.) | |
| Mouth of Pelican River, about..... | 1115 |
| At Dayton Bridge, near the north line of Sec. 29, Buse..... | 1064 |
| On the west line of Sec. 30, Buse..... | 1041 |
| Near the northeast corner of Sec. 33, T. 132, R. 44..... | 1014 |
| On the line between Otter Tail and Wilkin Counties..... | 1000 |
| Most southern bend of the Red River, in the northwest corner of Sec. 4, Bradford..... | 990 |

| | Feet above the sea. |
|--|---------------------|
| At railroad bridge, 2 miles east of Breckenridge (bed)..... | 956 |
| At bridge of the St. Paul, Minneapolis and Manitoba Railway, 1 mile northeast of Breckenridge, water..... | 951 |
| Mouth of the Bois des Sioux River, Breckenridge and Wahpeton... | 943 |
| Same, highest flood stage, about..... | 958 |
| (Lake Traverse, maximum depth about 15 feet, head of the Bois des Sioux River, low and high water.....) | 970-976 |
| Bois des Sioux River, at White Rock, bed, 966; ordinary low water.. | 968 |
| Same, 2 miles east of Fairmount..... | 963) |
| Connolly's Rapids, about 5 miles north of Breckenridge and Wahpeton, $1\frac{1}{2}$ miles long..... | 936-932 |
| At railroad bridge near foot of these rapids..... | 931 |
| At McCauleyville and Fort Abercrombie..... | 910 |
| Same, highest flood stage, about..... | 934 |
| (Surface of ground at Fort Abercrombie.....) | 937) |
| Mouth of Wild Rice River, North Dakota..... | 875 |
| (The foregoing, unless otherwise stated, denote the stage of ordinary low water.) | |
| At Moorhead and Fargo, bed, 862; ordinary low and high water, 870-885 or 890; extreme low and high water (range, 32 feet).... | 866-938 |
| The lowest and highest stages of the river here during the years 1879, 1880, and 1882 were as follows, according to gauge records by United States engineers. The high water of 1882 has not been exceeded during many years and marks approximately the maximum limit of the most exceptional floods. In ordinary years the highest stage ranges from 880 to 890 feet. In 1879 the river remained nearly at its lowest stage throughout the year. | |
| 1879, l. w., May 3, 866.33; h. w., July 15, 867.33. | |
| 1880, l. w., Apr. 21, 869.40; h. w., Apr. 3, 879.73. | |
| 1882, l. w., Oct. 3, 868.21; h. w., Apr. 12, 898.37. | |
| Mouth of Sheyenne River, ordinary low water..... | 857 |
| Mouth of Buffalo River, extreme low and high water, about..... | 850-882 |
| Mouth of Elm River, Quincy, ordinary low water..... | 838 |
| Extreme low and high water (range, 36 feet)..... | 834-870 |
| The lowest and highest stages of the river here during the years 1879, 1880, and 1882 were as follows, according to gauge records by United States engineers: | |
| 1879, l. w., May, 833.70. | |
| 1880, l. w., Oct. 13, 836.50; h. w., June 15, 844.10. | |
| (1881, h. w., May, about 860.) | |
| 1882, l. w., Sept. 25, 836.63; high water April, 869.90. | |
| Mouth of Wild Rice River, Minnesota, ordinary low water, about.. | 834 |
| Mouth of Goose River, Caledonia, ordinary low water..... | 822-824 |
| Extreme low and high water (range, 40 feet)..... | 821-861 |
| The lowest and highest stages of the river here during the years 1880 to 1882 were as follows, according to gauge records by United States engineers: | |
| (1879, l. w., May, 821.3). | |
| 1880, l. w., Oct. 4, 821.75; h. w., June 14, 829.05. | |
| 1881, l. w., Aug. 20, 822.70; h. w., May, 850.90. | |
| 1882, l. w., Sept. 28, 821.40; h. w., April, 860.90. | |
| Goose Rapids, shallow water, with the channel obstructed by bowlders, extending from the mouth of Goose River about 12 miles (measured in the meandering course of the Red River).... | 822-810 |
| Mouth of Sand Hill River, about..... | 800 |
| At Belmont (formerly Frog Point), extreme low and high water (range, 50 feet)..... | 797-847 |
| Mouth of Red Lake River, Grand Forks, bed..... | 779 |
| Extreme low and high water (range, 44 feet)..... | 784-828 |
| The lowest and highest stages of the river here during the years 1882 to 1887 were as follows, according to gauge records by United States engineers: | |
| (1879, l. w., May, 785.40; 1881, h. w. May, 818.) | |
| 1882, l. w., Sept. 24, 785.65; h. w., Apr. 17, 827.90. | |
| 1883, l. w., Sept. 30, 787.40; h. w., Apr. 25, 822.10. | |
| 1884, l. w., Aug. 18, 785.80; h. w., Apr. 16, 811.00. | |
| 1885, l. w., Nov. 15, 785.70; h. w., Apr. 17, 803.00. | |
| 1886, l. w., Oct. 5, 783.70; h. w., May 4, 800.50. | |
| 1887, l. w., Nov. 20, 784.10; h. w., Apr. 15, 796.20. | |

| | Feet above the sea. |
|---|---------------------|
| Mouth of Turtle River, Sec. 11, T. 154, R. 51, ordinary low water... | 778 |
| At Acton (formerly Kelley's Point), 2½ miles north from the mouth of Forest River, ordinary low water | 773 |
| Mouth of Park River, St. Andrew, about | 769 |
| At Pelican Bar, ordinary low water | 758 |
| Mouth of Pembina River, Pembina and St. Vincent, bed | 739 |
| Ordinary low and high water | 753-782 |
| Extreme low and high water (range, 40 feet) | 748-788 |
| (Surface of ground at Fort Pembina | 787) |
| At Emerson, ordinary low water and extreme high water | 750-787 |
| The following elevations of the Red River at Winnipeg and northward are derived from surveys for the Canadian Pacific Railway, being in considerable part from the published report of Sandford Fleming, engineer in chief, 1880, p. 269, from which a uniform subtraction of 6 feet is here made to accord with the revised profile of this railway. | |
| Mouth of Assiniboine River, Winnipeg, extreme low water | 724 |
| Ordinary summer stage | 730 |
| Ordinary spring floods | 740-745 |
| High water, 1882 | 750 |
| Same, 1860 | 759 |
| Same, 1852 | 761 |
| Same, 1826 | 763 |
| General level of the land surface | 758 |
| Extreme low and high water (range, 39 feet) | 724-763 |
| At the Louise Bridge, Winnipeg, extreme low water | 723 |
| Ordinary spring floods, about | 740 |
| High water, 1882 | 749 |
| Same, 1826 | 763 |
| General level of the land surface | 756 |
| Extreme low and high water (range 40 feet) | 723-763 |
| At St. Andrew's Church, extreme low water | 715 |
| Ordinary spring floods, about | 735 |
| High water, 1852 | 745 |
| Same, 1826 (nearly the same as the general level of the land surface) | 753 |
| Extreme low and high water (range, 38 feet) | 715-753 |
| At Lower Fort Garry (the "Stone Fort"), extreme low water | 711 |
| Ordinary spring floods, about | 730 |
| High water, 1852 | 736 |
| Same, 1826 | 746 |
| General level of the land surface | 752 |
| Extreme low and high water (range, 35 feet) | 711-746 |
| At West Selkirk, extreme low water | 710 |
| Ordinary spring floods, about | 720 |
| High water, 1852 | 726 |
| Same, 1826 | 732 |
| General level of the land surface | 739 |
| Extreme low and high water (range, 22 feet) | 710-732 |
| At St. Peter's Church, general level of the land surface | 730 |
| Extreme low and high water (range, 15 feet) | 709-724 |
| Lake Winnipeg, mean | 710 |
| Extreme low and high water, approximately | 708-713 |

(The maximum depth of Lake Winnipeg, according to Mr. J. Hoyes Panton, is 65 feet.)

From Otter Tail Lake to near Breckenridge the range of the Red River from low to extreme high water is only about 5 feet. Thence it rapidly increases, becoming 32 feet at Moorhead and Fargo and attaining its maximum of 50 feet at Belmont. It continues nearly at 40 feet from Grand Forks to the international boundary and Winnipeg. At Lower Fort Garry, 16 miles north of Winnipeg and about 20 miles from the mouth of the river, it is 35 feet; but beyond that point it rapidly diminishes in approaching Lake Winnipeg. Floods rising nearly or quite to the high-water line thus noted have been rare, occurring in 1826, 1852, 1860, 1861, and 1882. They are caused in the spring by the melting of unusual supplies of snow and by accompanying heavy rains, and often are increased by gorges of ice.

PELICAN RIVER.

| | Feet above the sea. |
|--|---------------------|
| One mile east of Detroit (mill pond)..... | 1345 |
| Detroit Lake | 1335 |
| Lakes Sallie and Melissa..... | 1330 |
| Pelican Lake (maximum depth about 40 feet)..... | 1320 |
| Cormorant Lake, about | 1340 |
| Lakes Lizzie and Lida | 1315 |
| [Lake Lida, according to soundings by Rev. C. M. Terry, ranges from 10 to 40 feet in depth.] | |
| Above and below the dam at Pelican Rapids..... | 1303-1291 |
| At railroad bridge, 1½ miles north of Erhart's Station | 1269 |
| At railroad bridge, 1 mile north of Elizabeth Station | 1222 |
| On the line between Elizabeth and Fergus Falls, estimated | 1200 |
| At the bridge of the St. Paul, Minneapolis and Manitoba Railway, in the east edge of Sec. 13, Carlisle..... | 1151 |
| At the bridge of the Northern Pacific, Fergus and Black Hills (Northern Pacific) Railroad | 1124 |
| Junction with the Red River, about..... | 1115 |

BUFFALO RIVER.

| | |
|---|---------|
| Buffalo Lake, about..... | 1400 |
| At the most eastern railroad bridge, 3 miles east of Hawley | 1150 |
| At the railroad bridge, 0.4 mile east of Hawley..... | 1131 |
| At the railroad bridge, 4½ miles east of Glyndon..... | 940 |
| Same, 1½ miles north of Glyndon..... | 908 |
| Junction with the Red River, low and high water..... | 850-882 |

WILD RICE RIVER, MINNESOTA.

| | |
|---|-----------|
| Upper and Lower Rice Lakes, Twin Lakes, Tulaby, and White Earth Lakes | 1500-1450 |
| In the eastern part of Sec. 30, Fosum (T. 144, R. 43), about..... | 1050 |
| In the SW. ¼ of Sec. 25, Wild Rice (T. 144, R. 44), on line of survey for branch of the St. Paul, Minneapolis and Manitoba Railway.. | 1025 |
| At bridge of the Duluth and Manitoba Railroad, near Twin Valley.. | 985 |
| Two and a half miles south of Ada | 900 |
| Long Lake, at Ada, former channel of the Wild Rice River..... | 901 |
| [Thence westward this stream formerly flowed in the present course of the Marsh River.] | |
| Junction with the Red River, about..... | 834 |

SAND HILL RIVER.

| | |
|---|------|
| Maple Lake..... | 1169 |
| Near the center of Sec. 13, Garfield (T. 147, R. 44), on line of survey for branch of the St. Paul, Minneapolis and Manitoba Railway.. | 1116 |
| At bridge of the Duluth and Manitoba Railroad, in Sec. 28, Garfield.. | 1075 |
| At ford of the old Pembina trail, near the west line of this Sec. 28, Garfield | 1071 |
| At Beltrami..... | 895 |
| Junction with the Red River, about | 800 |

RED LAKE RIVER.

| | |
|---|------|
| Highest (east) part of portage, 6 miles long, from the West Branch of the Big Fork of Rainy River, about..... | 1165 |
| West end of this portage, ¼ mile above the forks of Tamarack or Swamp River, "about 18 miles by river, or 10 by land" from Red Lake (N. Butler), about..... | 1155 |
| Red Lake, estimated..... | 1150 |
| [The maximum depth of this lake, in its southern half, is 40 to 50 feet.] | |
| Mouth of Thief River | 1099 |
| At St. Hilaire, about..... | 1065 |
| Half a mile above the mouth of Clearwater River..... | 948 |
| Mouth of Clearwater River, Red Lake Falls..... | 940 |

| | Feet above the sea. |
|---|---------------------|
| Clearwater River, below mill in west part of NE. $\frac{1}{4}$ of NE. $\frac{1}{4}$ of Sec. 22, Red Lake Falls..... | 950 |
| Same, $\frac{1}{4}$ mile above (south of) this mill..... | 965 |
| [The range from low to high water of both Red Lake and Clearwater Rivers at Red Lake Falls is only 5 feet.] | |
| Red Lake River, at bridge of the Duluth and Manitoba Railroad.. | 932 |
| At Crookston railroad bridge, ordinary stage, 833; low and high water, about..... | 830-850 |
| Junction with the Red River, Grand Forks, bed, 779; low and high water..... | 784-828 |

WILD RICE RIVER, NORTH DAKOTA.

| | |
|--|------|
| Two miles west of Rutland..... | 1202 |
| At Ransom..... | 1117 |
| Taylor Lake (20 feet deep), $2\frac{1}{4}$ miles west of the Lightning's Nest, about..... | 1050 |
| Swan Lake, 8 miles WNW. from the last, about..... | 1070 |
| Near the center of Sec. 25, T. 132, R. 52, $3\frac{1}{4}$ miles south of Wyndmoro, about..... | 1010 |
| At bridge on east line of SE. $\frac{1}{4}$ of Sec. 30, Berlin (T. 131, R. 49), most southern bend of the river..... | 974 |
| Four and a half miles west of Wahpeton..... | 940 |
| At bridge of the St. Paul, Minneapolis and Manitoba Railway, $1\frac{1}{4}$ miles northeast from the last..... | 936 |
| Junction with the Red River..... | 875 |

SHEYENNE RIVER.

| | |
|--|-----------|
| Devil's Lake (having no outlet), low and high water, 1880-1889 .. | 1430-1434 |
| Stump Lake (also having no outlet)..... | 1417 |
| At bridge of the Jamestown and Northern Railroad, near Sheyenne. | 1410 |
| At Valley City..... | 1200 |
| At Lisbon..... | 1064 |
| In Sec. 32, T. 134, R. 54, 2 miles ENE. from its most southern bend..... | 1039 |
| On the west line of the NW. $\frac{1}{4}$ of Sec. 29, T. 135, R. 54..... | 1021 |
| At bridge near the middle of the south side of Helendale (T. 136, R. 52), about..... | 960 |
| At Kindred..... | 930 |
| At bridge of the Fargo and Southwestern Railroad..... | 897 |
| At Haggart..... | 881 |
| Mouth of Maple River, about..... | 872 |
| At railroad bridge, $1\frac{1}{4}$ miles northwest of Harwood..... | 862 |
| Junction with the Red River..... | 857 |

MAPLE RIVER.

| | |
|---|------|
| At bridge of the Northern Pacific Railroad between Buffalo and Tower City..... | 1130 |
| In Sec. 32, T. 137, R. 54, about 2 miles northeast from its most southern bend..... | 1019 |
| At Durbin..... | 904 |
| At Mapleton..... | 888 |
| Junction with the Sheyenne River, about..... | 872 |

ELM RIVER.

| | |
|--|------|
| South Fork at Hunter..... | 962 |
| South Branch of the North Fork, $3\frac{1}{4}$ miles south of Galesburg..... | 1062 |
| North Branch of the North Fork at Galesburg..... | 1063 |
| North Fork at Blanchard..... | 927 |
| Elm River at Grandin..... | 865 |
| North Branch at Kelso..... | 888 |
| Junction with the Red River, Quincy..... | 838 |

GOOSE RIVER.

Feet above th

| | |
|--|-------|
| South Fork, near the southwest corner of Sec. 3, T. 145, R. 54, about..... | |
| North Branch of the Middle Fork, where it intersects the Herman beach of Lake Agassiz, in the southeast part of Sec. 26, T. 147, R. 55, about..... | |
| Golden Lake (about 20 feet deep), low and high water..... | 1122- |
| Fingal's Creek, where it intersects the Herman beach, northwest corner of Sec. 23, T. 148, R. 55, about..... | |
| Goose River and Little Goose River, where they intersect the Herman beach, respectively, in Secs. 35 and 15, T. 150, R. 55, about.. | |
| Goose River, at Portland, bed, 933; water..... | |
| At Mayville, bed, 924; water held by dam..... | |
| At Hillsboro, water..... | |
| Junction with the Red River, Caledonia..... | |

TURTLE RIVER.

| | |
|--|-----|
| South Branch, where it intersects the Herman Beach of Lake Agassiz, in the SW. $\frac{1}{4}$ of Sec. 18, Elm Grove (T. 152, R. 55), about..... | |
| Same, 4 miles northwest from Larimore..... | |
| Same, at its most southern bend, $1\frac{1}{4}$ miles north of Larimore, about..... | |
| North Branch, at bridge in the east end of Bachelors' Grove, on the east line of the SE. $\frac{1}{4}$ of Sec. 30, Agnes (T. 153, R. 55)..... | |
| Same, at railroad bridge $2\frac{1}{4}$ miles north of McCanna (bed)..... | |
| Junction of South and North Branches, about..... | |
| Turtle River, $1\frac{1}{4}$ miles north of Arvilla, about..... | |
| Same, in Sec. 22, Mekinock (T. 152, R. 53), about..... | 89' |
| At bridge of the Duluth and Manitoba Railroad, near Mekinock Station..... | |
| At Manvel, low and high water..... | 79' |
| Junction with the Red River, Sec. 11, Turtle River (T. 154, R. 51)..< | |

FOREST RIVER.

| | |
|---|-----|
| South and Middle Branches, where they intersect the uppermost shore of Lake Agassiz, west of the Elk Valley, about..... | |
| North Branch, at its intersection of this shore-line, near the center of Sec. 20, Vernon (T. 156, R. 56), about..... | |
| Junction of the South and North Branches, in Sec. 5, Inkster (T. 154, R. 55), about..... | |
| At railroad bridge, $1\frac{1}{4}$ miles north of Inkster..... | |
| At intersection of a beach of Lake Agassiz, in the east part of Sec. 2, Strabane (T. 154, R. 54), about..... | |
| At bridge of the Duluth and Manitoba Railroad, near Forest Station..... | |
| At Minto, low and high water..... | 79' |
| Junction with the Red River..... | |

PARK RIVER.

| | |
|--|-------|
| South Branch, at the Garfield bridge, about..... | |
| Same, in its course $1\frac{1}{4}$ miles through "the mountains" east of the Golden Valley, about..... | 1165- |
| Same, at Park River..... | |
| Same, near the middle of the south side of Sec. 17, Fertile (T. 157, R. 54), about..... | |
| Middle Branch, at bridge of the Langdon line, St. Paul, Minneapolis and Manitoba Railway..... | |
| Same, at middle of south side of Sec. 5, Lampton (T. 158, R. 56), about..... | |
| Same, in the southwest part of Sec. 12, Lampton, about..... | |
| Same, at bridge on east side of NE. $\frac{1}{4}$ of Sec. 29, Glenwood (T. 158, R. 54)..... | |
| North Branch, at bridge about $1\frac{1}{4}$ miles west of Gardar..... | |
| Same, in the west part of Sec. 13, T. 159, R. 56, 3 to $3\frac{1}{4}$ miles east of Gardar..... | 1025- |
| Same, at middle of east side of Sec. 5, Glenwood, about..... | |
| Park River at Grafton, low and high water..... | 80' |
| Junction with the Red River, St. Andrew, about..... | |

TONGUE RIVER.

| | Feet above the sea. |
|--|---------------------|
| At bridge, near the center of the south half of Sec. 28, T. 161, R. 56, about..... | 1110 |
| At Mr. Abner French's, near the center of Sec. 18, T. 161, R. 55..... | 934 |
| At bridge, about 1 mile northeast from the last, about..... | 970 |
| At bridge, Cavalier..... | 864 |
| At Bathgate, bed, 801; low and high water..... | 803-816 |
| Junction with the Pembina River, about..... | 770 |

PEMBINA RIVER.

| | |
|--|-----------|
| Whitewater Lake, low and high water..... | 1632-1637 |
| At bridge of the Manitoba and Southwestern Railway, near Little Pembina Station, 68 miles west of Manitou..... | 1605 |
| Divide between the Souris and Pembina Rivers, in Lang's Valley (outlet of the glacial Lake Souris)..... | 1364 |
| Bone Lake, in Lang's Valley..... | 1357 |
| Grass Lake and Pelican Lake..... | 1355 |
| (Range of Pelican Lake, from low to high water, 3 feet.) | |
| Lakes Lorne and Louise, about..... | 1345 |
| Rock Lake, about..... | 1335 |
| At the Marringhurst bridge, about..... | 1330 |
| Swan Lake, about..... | 1310 |
| At bridge of Manitoba and Southwestern Railway, La Rivière..... | 1287 |
| At the Mowbray bridge, on the line between Secs. 21 and 22, T. 1, R. 8, Manitoba, about..... | 1235 |
| On the international boundary, about..... | 1125 |
| At the "fish trap," 7 miles west of Walhalla, N. Dak. (fall, 7 feet in $\frac{1}{4}$ mile), estimated about..... | 1050-1043 |
| At the Walhalla bridge, low and high water..... | 934-948 |
| At the St. Joseph bridge, 7 miles east from the last..... | 865 |
| At Neche, bed, 810; low and high water..... | 813-832 |
| Mouth of Tongue River, about..... | 770 |
| At bridge of the Duluth and Manitoba Railroad..... | 757 |
| Junction with the Red River, Pembina, extreme low and high water..... | 748-788 |

ASSINIBOINE RIVER.

[From railway profiles; from the U. S. Geological Survey of Lake Agassiz; and from surveys by H. S. Troherne, engineer, St. Paul, referred to sea level by comparison with the Canadian Pacific Railway.]

| | Feet above the sea. |
|---|---------------------|
| At bridge of the Manitoba and Northwestern Railway, bed, 1,309; water..... | 1314 |
| Mouth of the Qu'Appelle River, about 17 miles south of the forgoing..... | 1264 |
| Fort Ellice, at top of the river bluff here..... | 1484 |
| At bridge of the Canadian Pacific Railway, $1\frac{1}{2}$ miles east of Brandon..... | 1161 |
| Mouth of Souris River, approximately..... | 1100 |
| At outcrop of Niobrara limestone in Sec. 36, T. 8, R. 11, about $3\frac{1}{2}$ miles east from the mouth of Cypress River, approximately..... | 1000 |
| At Portage la Prairie, ordinary low and high water 2 miles southwest from the town, near the former site of the Hudson Bay Company's fort, 842-850; extreme high water, May 3-15, 1882, when the river overflowed here, sending part of its waters north to Lake Manitoba, 854..... | 842-854 |
| This rise was caused by an ice jam a few miles farther east. It is said that the river had previously overflowed here to Lake Manitoba about 20 years before [probably in 1860]. | |
| Big Slough, occupying a deserted channel of the Assiniboine River close south of Portage la Prairie, ordinary stage of water, 849; in ordinary spring floods, 850; in the great flood of May, 1882, 854..... | 849-854 |
| At Pratt's Landing, $2\frac{1}{4}$ miles southeast from Portage la Prairie, ordinary low and high water, 840-849; lowest and highest stages..... | 837-852 |
| Lake Manitoba, mean, 809; lowest and highest stages, approximately..... | 805-813 |

| | Feet above the sea. |
|--|---------------------|
| Lowest portion of the divide between Lake Manitoba and Long Lake, approximately..... | 812 |
| Long Lake, 6 miles long and less than a mile wide, 6 inches to 6 feet deep, between Reaburn and Poplar Point Stations of the Canadian Pacific Railway, occupying a former channel of the Assiniboine River, ordinary low and high water..... | 798-803 |
| [“The immediate banks of Long Lake are from 6 to 10 feet high, sloping up gradually.”] | |
| Assiniboine River, at center of lot 142, Baie St. Paul, near the south-east end of Long Lake, top of river bank, 808; water, ordinary stage..... | 796 |
| In lot 230, Baie St. Paul, top of river bank, 794; water, ordinary stage..... | 779 |
| At St. Francois Xavier Church, top of river bank, 784; water, ordinary stage..... | 765 |
| At crossing of the “Winnipeg meridian,” in Headingly, ordinary stage..... | 757 |
| At Headingly, 1½ miles farther east, ordinary low and high water.. | 754-764 |
| Mouth of Sturgeon Creek, ordinary stage..... | 745 |
| Sturgeon Creek at bridge about a half mile from the Assiniboine River..... | 753 |
| At St. James, ordinary low and high water..... | 736-754 |
| Junction with the Red River, Winnipeg, top of the river bank, 757; ordinary low stage of water (Oct. 1, 1874), 728; usual summer level, 730; usual spring flood, about 742; extreme low and high water..... | 724-763 |

LAKES ON THE QU'APPELLE RIVER.

[From H. Y. Hind; referred to sea level approximately by comparison with elevations determined by leveling.]

| | Feet above the sea. |
|---|---------------------|
| Elbow of the South Saskatchewan River..... | 1619 |
| Ponds (about 10 feet deep) on the River that Turns..... | 1686 |
| Divide in ancient water course between the South Saskatchewan and Qu'Appelle Rivers (outlet of the glacial Lake Saskatchewan).. | 1704 |
| Sand Hill or Eyebrow Lake (about 20 feet deep)..... | 1685 |
| Buffalo Lake (about 20 feet deep)..... | 1635 |
| Qu'Appelle River, at bridge of the Regina and Long Lake Railway.. | 1595 |
| Long Lake, tributary to the Qu'Appelle River..... | 1598 |
| Fishing lakes, four in number, with intervening descents of about a foot..... | 1504-1500 |
| The maximum depths of these lakes, successively in descending order, are 54, 57, 48, and 66 feet. | |
| Crooked Lake (maximum depth, 36 feet)..... | 1389 |
| Round Lake (maximum depth, 30 feet)..... | 1364 |
| Junction of the Qu'Appelle with the Assiniboine..... | 1264 |

SOURIS OR MOUSE RIVER.

| | |
|--|-----------|
| On the international boundary, crossing from Assiniboia into North Dakota, 215 miles west of the Red River, about..... | 1650 |
| At Minot, N. Dak..... | 1535 |
| At Towner, N. Dak..... | 1445 |
| Crossing the international boundary, 170 miles west of the Red River, about..... | 1400 |
| At Plum Creek, Manitoba, about..... | 1335 |
| At the Elbow west of Lang's Valley, 21 miles ESE. from the last, about..... | 1265 |
| At Gregory's Mill, in Sec. 34, T. 6, R. 18, 5 miles north from the last, head, 8 feet, about..... | 1210-1202 |
| At Souris City..... | 1164 |
| At Milford..... | 1114 |
| Junction with the Assiniboine River, about..... | 1100 |

SASKATCHEWAN RIVER.

[From surveys of the Canadian Pacific Railway; of the Geological and Natural History Survey of Canada, by Dr. G. M. Dawson, R. G. McConnell, and J. B. Tyrrell; and of the Assiniboine and Saskatchewan Exploring Expedition, by H. Y. Hind.]

| | Feet above the sea. |
|---|---------------------|
| Bow River at the Gap, where it issues from the Rocky Mountains, about..... | 4215 |
| Same, at Calgary, mouth of the Elbow River..... | 3390 |
| Same, at the Blackfoot crossing, near center of T. 21, R. 21..... | 2595 |
| Belly River at the "Coal Banks," Lethbridge..... | 2717 |
| Confluence of the Bow and Belly Rivers, forming the South Saskatchewan..... | 2212 |
| South Saskatchewan River at Medicine Hat, low and high water.. | 2137-2154 |
| Same, at mouth of Red Deer River..... | 1958 |
| Same, in T. 22, R. 18, long. 108° 27'..... | 1782 |
| Same, at the Elbow..... | 1619 |
| North Saskatchewan River at the Rocky Mountain House and mouth of Clearwater River, about..... | 3150 |
| Same, mouth of Brazeau River..... | 2661 |
| Same, at big coal seam (27 feet thick, but including 2 feet of shale), Goose Encampment, long. 114° 30'..... | 2331 |
| Same, at proposed crossing of the original line of the Canadian Pacific Railway, long. 114°, about..... | 2160 |
| Same, at Edmonton, about..... | 2025 |
| (Edmonton, 200 feet above high-water level of the river, about 2,235.) | |
| Same, at Victoria, near mouths of Egg and Smoky Creeks..... | 1895 |
| Same, at Fort Pitt..... | 1746 |
| Junction of the South and North Saskatchewan Rivers, estimated.. | 1200 |
| Cedar Lake..... | 824 |
| Cross Lake..... | 818 |
| Head and foot of Grand Rapids of the Saskatchewan River, extending from about 4½ to 2 miles above its mouth (fall stated by Hind to be 43½ feet in these 2½ miles, the upper 28½ feet being passed by a portage a little more than a mile long), approximately..... | 765-720 |
| Lake Winnipeg, mean, 710; low and high water, approximately... | 708-713 |

NELSON RIVER.

The following estimated elevations of points on the Nelson River are by Dr. Robert Bell (Reports of Progress, Geological Survey of Canada, 1877-79).

| | Feet above the sea. |
|---|---------------------|
| Lake Winnipeg..... | 710 |
| Great and Little Playgreen Lakes, also..... | 710 |
| Sea River Falls, 17 miles below Norway House, about..... | 705-700 |
| Pipestone and Cross Lakes, on the Nelson River at the north end of Ross Island, about..... | 665 |
| Sipi-wesk Lake, on Nelson River from lat. 55° to 55° 20', about..... | 565 |
| Grand Rapid, "a descent of about 15 feet in the form of a steep chute," 4 miles south of Split Lake, about..... | 460-445 |
| Split Lake, in lat. 56° 15' to 56° 35', about..... | 440 |
| Gull Lake, 18 miles below (ENE. of) Split Lake, about..... | 420 |
| Twelve-foot chute, 43 miles below (east of) Gull Lake, about..... | 200-188 |
| Foot of Broad Rapid, "2 miles wide and full of knobs and little ridges of gneiss," extending 5 miles next below the Twelve-foot chute, or 116 to 111 miles from the mouth of Nelson River, about..... | 125 |
| Foot of First or Lowest Limestone Rapid, about 90 miles by the course of the river above its mouth, probably about..... | 50 |

The effect of the tide extends to Gillam's or Lower Seal Island, which is about 20 miles from Hudson Bay. Spring tides on the west coast of Hudson Bay are quite uniformly 11 or 12 feet, being greater than on the east coast. They are highest at the mouth of the Nelson River, amounting there to about 15 feet.

The average depth of Hudson Bay is "about 70 fathoms throughout, deepening to 100 and upwards in approaching the outlet of Hudson's Strait; while in the strait itself the soundings along the center vary from about 100 to upwards of 300 fathoms. The bottom appears to consist almost everywhere of boulder clay and mud."—Dr. Bell, in *Can. Geol. Surv., Rep. of Prog. for 1879-'80*, pp. 28-30 C.

**ALTITUDES OF WATERSHEDS, HILLS, MOUNTAINS, LAKES, AND
STREAMS, ON ROUTES OF GEOLOGICAL
OR OTHER SURVEYS.**

ADDITIONAL NOTES FROM RAILROAD SURVEYS IN MINNESOTA.

CARVER COUNTY.

[From E. S. Alexander, engineer, Minneapolis.]

| | Feet above the sea. |
|--|---------------------|
| Lake Lucy, Chanhassen | 954 |
| Minnewashta Lake | 945 |
| Picture or Mud Lake, Watertown | 940 |
| South Fork of Crow River, above and below the dam at Watertown | 927-920 |
| Bluff on east side here | 976 |
| Ocean marsh, Secs. 7 and 8, Hollywood | 999 |

MCLEOD COUNTY.

[Also from E. S. Alexander, engineer, Minneapolis.]

| | |
|--------------------|------|
| Winsted Lake | 996 |
| Swan Lake | 1047 |

OLMSTED COUNTY.

[From Horace Horton, engineer, Rochester.]

| | |
|---|------|
| Top of Lone Mound, Sec. 11, Farmington | 1175 |
| Base of Sugar Loaf, Secs. 31 and 32, Haverhill | 1033 |
| North Middle Branch of Zumbro River at Oronoco | 958 |
| Center of Sec. 21, Oronoco | 1108 |
| Quarter-section stake between Secs. 33 and 34, Oronoco | 1133 |
| Northwest corner of Sec. 10, Cascade | 1143 |
| Creek near the schoolhouse in Sec. 15, Cascade, about | 1008 |
| College street bridge, Rochester | 983 |
| South Branch of Zumbro River here | 968 |
| Southeast corner of Sec. 10, High Forest | 1310 |
| Low water in the North Branch of Root River at High Forest vil- lage | 1213 |
| Pleasant Grove, about | 1310 |

MOWER COUNTY.

[Also from Horace Horton, engineer, Rochester.]

| | |
|--|------|
| Section 29, Pleasant Valley, $\frac{1}{4}$ mile south of John Rowley's house.. | 1400 |
| Dr. Thornhill's farm, 4 miles east of Brownsdale | 1373 |

FREEBORN COUNTY.

[From William Morin, engineer, Albert Lea.]

| | |
|--|------|
| Geneva Lake | 1222 |
| Clark's Grove, $3\frac{1}{4}$ miles southwest from Geneva Lake | 1322 |

CHAINS OF LAKES IN MARTIN COUNTY.

[The partially filled ancient water courses in which these lakes lie are probably interglacial. Geol-
ogy of Minnesota, vol. I, pp. 479-485.]

| | Feet above the sea. |
|---|---------------------|
| East chain of lakes (maximum depths, about 15 feet) | 1160-1180 |
| Central chain of lakes (8 to 50 feet deep) | 1165-1190 |
| West chain of lakes (5 to 20 feet deep) | 1200-1250 |

ST. PAUL AND VICINITY.

[From F. W. McCoy, assistant city engineer; and from surveys for railways and water works.]

| | Feet above the sea. |
|---|---------------------|
| Zero of Signal Service gauge, Mississippi River, at foot of Jackson street..... | 682.53 |
| Zero of gauge on pier of the Wabashaw street bridge..... | 682.52 |
| Zero of city levels..... | 692.60 |
| Mississippi River, extreme low water (1864 and Dec., 1878, Maj. C. J. Allen)..... | 683 |
| Same, lowest stage in ordinary years..... | 685 |
| Same, extreme high water (Apr. 29, 1881, Major Allen)..... | 702 |
| Union depot..... | 703 |
| Robert street bridge, highest part of roadway (level span, 352 feet long)..... | 763 |
| Intersection of Wabashaw and Third streets (3 or 4 feet above the north end of the Wabashaw street bridge)..... | 787 |
| South end of the Wabashaw street bridge..... | 713 |
| Intersection of Wabashaw and Tenth streets, at the northwest corner of the capitol ground..... | 796 |
| Summit of Dayton bluff, intersection of Seventh and Hope streets, natural surface, 915; grade..... | 899 |
| Summit of Robert street at its junction with Jackson street, natural surface, 897; grade..... | 879 |
| Summit of St. Anthony hill, on Summit avenue, between Arundel and Lawton streets, grade..... | 926 |
| The following elevations of lakes near St. Paul and northward are from a Report on Plans for the Water Supply of St. Paul, by Joseph P. Fritzell, 1882, and from railway surveys. | |
| Lake Phalen..... | 859 |
| Lake Como..... | 885 |
| Lake Elmo (Lower Bass Lake)..... | 886 |
| Upper Bass Lake..... | 900 |
| Sandy Lake, Sec. 18, New Canada..... | 869 |
| Vadnais Lake..... | 881 |
| Pleasant Lake..... | 891 |
| White Bear Lake..... | 923 |
| Bald Eagle Lake..... | 908 |
| Clearwater Lake, Centerville..... | 885 |
| Clear Lake, $\frac{1}{2}$ mile southwest of Forest Lake..... | 889 |
| Forest Lake, 24 miles north of St. Paul..... | 900 |

MINNEAPOLIS AND VICINITY.

[Mostly from profiles in the office of Andrew Rinker, city engineer.]

| | Feet above the sea. |
|--|---------------------|
| Zero of city levels..... | 708.64 |
| Mississippi River, crest of St. Anthony Falls, ordinary stage of water held by dams, 794; highest stage of flowage by dams, 796; highest stage of floods, 802..... | 794-802 |
| Same, close below the falls, under the east end of the St. Paul, Minneapolis and Manitoba stone arch bridge..... | 739-743 |
| Same, 1 mile below the falls, under the St. Paul and Northern Pacific bridge..... | 720 |
| St. Paul, Minneapolis and Manitoba (union) depot..... | 810 |
| Chicago, Milwaukee and St. Paul depot, Washington avenue..... | 826 |
| Old suspension bridge, roadway at abutments and center..... | 832-835 |
| New steel arch bridge, roadway, rising 3 feet from abutments to center over the pier..... | 833-836 |
| Same, bottom of pier, 777; top of same, of capstone beside the roadway..... | 837 |
| Same, bed of river (gravel), 784; ordinary stage of water..... | 794 |
| Washington avenue bridge over Bassett's Creek..... | 818 |
| Intersection of Hennepin and Lyndale avenues..... | 854 |
| Franklin avenue, at intersection of Nicollet avenue, 873; of Fourth avenue, 862; of Cedar avenue..... | 839 |
| University avenue, at intersection of Central avenue, 837; of Fourteenth avenue SE..... | 824 |

| | Feet above the sea. |
|--|---------------------|
| State University, about..... | 845 |
| Intersection of Monroe street and Broadway, NE | 843 |
| Southwest end of Hennepin avenue, on Thirty-sixth street, at gate of Lakewood Cemetery | 879 |
| Top of highest hill in Lakewood Cemetery, site of deep boring (unsuccessful) for artesian well, 1884-'85 | 895 |
| Cedar Lake | 857 |
| Lake of the Isles..... | 852½ |
| Lake Calhoun | 852 |
| Lake Harriet | 845 |
| (The elevations of this series of four lakes in the southwest part of Minneapolis were all taken the same day in October, at their stage of low water. The maximum depth of Lake Harriet, said to be the deepest of these lakes, is 80 feet.) | |
| Lake Minnetonka (maximum depths, 40 to 70 feet) ordinary stage, 927-8; low and high water..... | 925-929 |

NORTHEASTERN MINNESOTA.

[Mostly determined barometrically by Prof. N. H. Winchell, State geologist.]

LAKE SUPERIOR TO VERMILION LAKE (a).

[From the Ninth Annual Report of the Geological and Natural History Survey of Minnesota; corrected approximately by comparison with series b and c, and with the survey of the Duluth and Iron Range Railroad.]

| | Feet above the sea. |
|--|---------------------|
| Lake Superior..... | 602 |
| Summit of the portage, 5 miles from Grand Portage village..... | 1284 |
| Pigeon River, at north end of this portage..... | 1199 |
| South Fowl Lake..... | 1435 |
| Hills near this lake..... | 1760-1860 |
| North Fowl Lake | 1439 |
| Moose Lake | 1487 |
| Hill 1½ miles southwest of Moose Lake..... | 1970 |
| Mountain Lake..... | 1652 |
| Hill south of the narrows of Mountain Lake..... | 2003 |
| Watershed between Pigeon and Arrow Rivers on the international boundary..... | 1670 |
| Rove Lake | 1649 |
| Daniels Lake | 1621 |
| Birch Lake..... | 1645 |
| Hungry Jack Lake | 1652 |
| Bearskin Lake | 1680 |
| Fanny Lake | 1672 |
| Lake Miranda | 1733 |
| Pine Lake..... | 1454 |
| McFarland's Lake | 1453 |
| John Lake | 1452 |
| Caribou Lake..... | 1549 |
| Clearwater Lake | 1661 |
| (Mountain Lake, determined from the last, was found to be 1,656, proving approximate accuracy for the circuit of the foregoing 15 observations.) | |
| Mud or Rose Lake..... | 1500 |
| Rat Lake..... | 1506 |
| South Lake..... | 1535 |
| North Lake, also | 1535 |
| Watershed between South and North Lakes, i.e., between the basins of Lake Superior and Lake Winnipeg | 1573 |
| Gunflint Lake | 1530 |
| Banks's Pine Lake..... | 1385 |
| Saganaga Lake..... | 1368 |
| Otter Track Lake..... | 1326 |
| Knife Lake | 1322 |
| Maple Leaf Lake | 1319 |
| Sucker or Carp Lake..... | 1289 |
| Basswood Lake | 1244 |
| Kawasachong or Fall Lake..... | 1262 |

| | Feet above the sea. |
|--|---------------------|
| Long Lake | 1325 |
| Burnt-side Lake | 1356 |
| Mud Lake | 1370 |
| Vermilion Lake..... | 1357 |
| Pike River above its third rapids..... | 1390 |

LAKE SUPERIOR TO HUNGRY JACK LAKE (b).

[From the Tenth annual report of the Geological and Natural History Survey of Minnesota (with Plate II); corrected approximately by comparison with series d.]

| | Feet above the sea. |
|--|---------------------|
| Lake Superior | 602 |
| Summit $1\frac{1}{2}$ miles from Grand Marais on the trail to Rove Lake..... | 1387 |
| Summit $1\frac{1}{2}$ miles from Grand Marais on the "Iron Trail" | 1665 |
| Lake at head of the South Branch of Devil's Track River..... | 1617 |
| Devil's Track Lake | 1647 |
| Watershed between this and Tamarack Lake | 1750 |
| Tamarack Lake..... | 1715 |
| Owl Lake..... | 1731 |
| Little Pine Lake..... | 1737 |
| Clubfoot Lake..... | 1756 |
| Round Lake | 1791 |
| Lake Abita | 1932 |
| Brulé Mountain..... | 2044 |
| Lakes of Brulé River north of this mountain | 1538 |
| Little Lake (south of the Misquah Hills) | 1782 |
| Hills surrounding Little Lake, about..... | 2000 |
| Little Trout Lake..... | 1855 |
| Misquah Lake | 1840 |
| Misquah Hills, northeast and east of Misquah Lake..... | 2300-2400 |
| Cross Lake | 1810 |
| North Brulé Lake..... | 1799 |
| Caribou Lake..... | 1821 |
| Little Lake (north of the Misquah Hills)..... | 1824 |
| Poplar Lake..... | 1804 |
| Duck Lake | 1827 |
| Portage Lake..... | 1817 |
| Iron and Mayhew Lakes | 1796 |
| Hungry Jack Lake..... | 1652 |

SAGANAGA LAKE TO LAKE SUPERIOR (c).

[From the Tenth annual report of the Geological and Natural History Survey of Minnesota (with Plate I); starting with the elevation of Saganaga Lake from series a, and corrected approximately by the elevation of Lake Superior]

| | Feet above the sea. |
|---|---------------------|
| Saganaga Lake | 1368 |
| Town Line Lake..... | 1451 |
| Ogishkie Muncie (or Kingfisher) Lake..... | 1461 |
| Twin Peaks, south of Ogishkie Muncie Lake, about..... | 1950 |
| Fox Lake..... | 1509 |
| Ash or Agemok Lake..... | 1568 |
| Gobbemichigomog Lake | 1573 |
| Crooked Lake | 1585 |
| Little Saganaga Lake..... | 1593 |
| East-and-West Lake | 1599 |
| Lower Lake in Frog Rock River..... | 1609 |
| Upper Lake in Frog Rock River..... | 1626 |
| Watershed between this and Mesabi Lake | 1776 |
| Mesabi Lake..... | 1681 |
| Hills west and south of Mesabi and Duck Lakes, about..... | 1875 |
| Duck Lake | 1691 |
| L Lake..... | 1756 |
| Wind Lake | 1816 |
| Spotted Rock Lake..... | 1863 |
| Mesabi Range south of Spotted Rock Lake..... | 2019 |
| Young Sawbill Lake | 1797 |
| Rat Lake..... | 1802 |
| Burntwood Lake..... | 1782 |

| | Feet above the sea. |
|----------------------------|---------------------|
| Temperance River Lake..... | 1760 |
| Lake in Poplar River..... | 1792 |
| Square Lake..... | 1787 |
| Small Lake..... | 1780 |
| Camp Lake..... | 1768 |
| Smoke Lake..... | 1754 |
| Sunrise Lake..... | 1742 |
| Rice Lake..... | 1737 |
| Big Lake..... | 1647 |
| Sucker Lake..... | 1617 |
| Lake Superior..... | 602 |

LAKE SUPERIOR TO IRON LAKE (*d*).

[Barometric observations by E. LeM. Hoare in a reconnaissance for a proposed railroad, as noted in the Tenth annual report of the Geological and Natural History Survey of Minnesota, p. 85 (with Plate II); corrected approximately by comparison with series *b*.]

| | Feet above the sea. |
|---|---------------------|
| Lake Superior..... | 602 |
| South Branch of Devil's Track River..... | 1257 |
| Devil's Track River..... | 1637 |
| Devil's Track Lake..... | 1647 |
| Summit north of the Twin Lakes, in the SW. $\frac{1}{4}$ of Sec. 25, T. 63. R. 1 W..... | 1801 |
| Iron and Mayhew Lakes..... | 1796 |

RAINY LAKE TO KNIFE FALLS ON THE ST. LOUIS RIVER.

[From the notes of Col. C. Whittlesey and Prof. N. H. Winchell; referred to sea level approximately by leveling by S. J. Dawson, compared with the Canadian Pacific Railway, and by the elevations of Vermilion Lake and the Embarras River determined in the survey of the Duluth and Iron Range Railroad.]

| | Feet above the sea. |
|--|---------------------|
| Rainy Lake, low and high water, about 1115-1120; mean..... | 1117 |
| Namekan or Sturgeon Lake..... | 1126 |
| Sand Point Lake in Vermilion River, about..... | 1145 |
| Crane Lake in Vermilion River, about..... | 1150 |
| ("From marks observed on Crane, Sand Points, Nemakan, and Rainy Lakes, their waters appear to rise at some seasons to about 5 feet above their present level." [This was Sept. 5-9, 1848.]—Norwood in Owen's Report of a Geological Survey of Wisconsin, Iowa, and Minnesota, pp. 318, 319. | |
| Crane Lake portage, close above Crane Lake, has an ascent of 35 feet in 1 mile; and another portage a mile long, close below Rush Lake, ascends 78 feet.) | |
| Rush Lake in Vermilion River, 8 miles below Vermilion Lake, about..... | 1315 |
| Vermilion Lake..... | 1357 |
| Pike River at the northwest end of the portage to Embarras River, about..... | 1430 |
| Summit of portage, about..... | 1465 |
| Embarras River (lake-like) at the southeast end of this portage, about..... | 1415 |
| Lake about 5 miles long and $\frac{1}{4}$ mile wide, having its mouth at the Squagemaw bridge (in Sec. 5, T. 58, R. 15), about..... | 1350 |
| Mesabi Range on both sides of this lake, extending ENE., (named "Giant's Range" by Prof. N. H. Winchell in his Thirteenth annual report, Minnesota, p. 22)..... | 1750-1850 |
| (Where the Embarras River intersects the Mesabi (or Giant's) Range, it consists of a series of six or seven long and narrow lakes; indicating that a larger river flowed here during the recession of the ice-sheet, its deeply eroded channel having since been partially filled by alluvium from tributaries.) | |
| Lake next below the Squagemaw bridge, about..... | 1335 |
| Second lake below this bridge, "separated by narrows like a river into two parts," about..... | 1327 |
| Eshquagema (Squagemaw, i. e., last) Lake, about..... | 1320 |
| St. Louis River at mouth of East Savanna River (Whittlesey)..... | 1260 |
| Prairie Lake, 9 miles south from the last (Winchell), about..... | 1385 |
| Head of rapids above Knife Falls, St. Louis River..... | 1175 |

VARIOUS TOPOGRAPHIC DISTRICTS IN MINNESOTA.

| | Feet above the sea. |
|---|---------------------|
| Giant's Range, about 15 miles southeast of Vermilion Lake (according to Prof. N. H. Winchell), and extending thence east-northeastward to the north side of Gunfint Lake | 1800-2200 |
| Mesabi Range, about 20 miles southeast of Vermilion Lake (Winchell) and extending east-northeastward to the watershed between South and North Lakes, attaining the highest elevation in the State | 1800-2400 |
| The Misquah Hills, 2,300 to 2,400 feet (p. 185), are outliers of this range several miles south from its main course, which passes from South and North Lakes eastward to Mountain Lake. | |
| Sawteeth Mountains, near the shore of Lake Superior, from Temperance River to Grand Marais | 1300-1700 |
| Carlton's Peak, one of the Sawteeth Mountains, 1,542 (Owen), 1,529 (Hall). | |
| Great Palisades (Bayfield, quoted by Whittlesey) | 1055 |
| Wooded region of the Upper Mississippi River | 1200-1600 |
| Wooded region between Cass Lake and the Lake of the Woods | 1400-1100 |
| Lowest part of the watershed between Lake Winnebagoishish (1,290) and Bowstring Lake (1,321), on the head stream of the Big Fork of Rainy River (Whittlesey) | 1322 |
| Bowstring Lake, in its highest stage, is said to have "water connection" to Lake Winnebagoishish (Ninth An. Rep., Minn., p. 194). | |
| Lowest part of the watershed between Turtle Lake and Red Lake, only 11 feet above Cass Lake (Whittlesey) | 1311 |
| Adjacent hills are 72 feet higher | 1383 |
| Itasca Lake | 1462 |
| Wooded morainic hills south and west of Lake Itasca | 1500-1700 |
| Terminal moraine at White Earth Agency | 1600 |
| Same, east of Detroit | 1450-1500 |
| Same, east of Lake Lida | 1425 |
| Same, east of Fergus Falls | 1300 |
| Leaf Hills | 1400-1750 |
| Terminal moraine bordering Lake Whipple (1,135), at Glenwood .. | 1250-1400 |
| Blue Mounds, Pope County | 1250-1300 |
| Summit of highland in the northeast part of Langhei, Pope County, about | 1350 |
| Morainic hills surrounding Lake Minnetonka (927), about | 1000 |
| Kiester Hills, Faribault County | 1300-1400 |
| Blue Mounds, Cottonwood County | 1450-1525 |
| Coteau des Prairies, in Pipestone and Lincoln Counties | 1850-1960 |
| Red River flat at St. Vincent | 785-790 |
| Same, at mouth of Red Lake River (Grand Forks) | 830 |
| Same, at Moorhead and Fargo | 900-905 |
| Same, at Breckenridge and Wahpeton | 960 |
| Prairies of the Minnesota Valley | 1000-1200 |
| Same, of Waseca and Steele Counties | 1100-1300 |
| Same, of Freeborn and Mower Counties | 1200-1400 |
| Valley lands of the Mississippi River and its tributaries in Houston, Fillmore, Winona, Wabasha, and Goodhue Counties | 640-900 |
| Upland prairies of the same counties | 1000-1300 |

MORAINIC BELTS IN IOWA.

| | |
|--|-----------|
| Terminal moraine in Worth and Winnebago Counties | 1250-1350 |
| Pilot Mound, Hancock County, about | 1425 |
| Terminal moraine extending thence northwest to Fairmont, Minn. Same, west to Lake George | 1325-1225 |
| Same, in Wright and Franklin Counties | 1250-1300 |
| Same, in Hardin and Hamilton Counties | 1350-1200 |
| Mineral Ridge, in northern Boone County, about | 1250-1150 |
| Terminal moraine in Guthrie and Carroll Counties | 1200 |
| Same, in Sac and Buena Vista Counties | 1200-1325 |
| Same, in Palo Alto, Clay, Emmet, and Dickinson Counties | 1275-1500 |
| Spirit Lake, 1,395; morainic hills west of same | 1300-1600 |
| Terminal moraine in northeastern Osceola County | 1475-1525 |
| | 1550-1875 |

PLATEAUS, HILLS, AND LAKES IN SOUTH AND NORTH DAKOTA.

| | Feet above the sea. |
|---|---------------------|
| Coteau des Prairies, from the west line of Lincoln County, Minn., to its northern end, called the Head of the Coteau des Prairies, near the northeast corner of South Dakota, 35 miles west of Lake Traverse..... | 1900-2050 |
| Terminal moraines continuing thence northward through North Dakota to Devil's Lake and Turtle Mountain, mostly | 1400-1600 |
| Devil's Lake, low and high water, 1880-1889..... | 1430-1434 |
| (The maximum depths of the broad parts of this lake are 40 to 80 feet.) | |
| Devil's Heart Hill (determined barometrically by Nicollet)..... | 1722 |
| Sully's Hill (according to Andreas' Atlas of Dakota) | 1707 |
| Stump Lake (maximum depth, 75 to 100 feet), 7 miles southeast of Devil's Lake..... | 1417 |
| Sweetwater Lake (5 to 20 feet deep), 5 miles north of the city of Devil's Lake..... | 1468 |
| Crest of the First Pembina Mountain, near Walhalla, the eroded front of the Pembina delta of Lake Agassiz..... | 1175-1200 |
| Crest of the Second Pembina Mountain, a great escarpment 60 miles long, forming the eastern margin of a plateau or plain of the Fort Pierre shale..... | 1400-1500 |
| Turtle Mountain (according to Dr. G. M. Dawson's map)..... | 2150 |
| Same (according to profile in report of the United States Boundary Commission)..... | 2000-2534 |
| Butte St. Paul, highest point of Turtle Mountain, 700 feet above the general prairie level (according to Andreas' Atlas of Dakota). | 2300 |
| Bear Butte, Turtle Mountain (Andreas)..... | 2200 |
| Terminal moraine from the head of the Coteau des Prairies to the Coteau du Missouri, in Codington, Hamlin, Brookings, and Lake Counties, South Dakota..... | 1800-1900 |
| Coteau du Missouri, thence northward to the Northern Pacific Railroad | 1800-2200 |
| Same, in the northwest part of North Dakota and on the international boundary | 2000-2400 |

BLACK HILLS.

[From Newton and Jenney's Report on the Geology and Resources of the Black Hills of Dakota, 1880.]

| | Feet above the sea. |
|---|---------------------|
| Harney Peak, highest point of the Black Hills..... | 7368 |
| Crook Tower | 7325 |
| Terry Peak | 7215 |
| Custer Peak | 6932 |
| Warren's Peak (Jenney in Gannett's Dictionary of Altitudes) | 6900 |
| Inyan Kara, 6,870 (p. 553, but 6,563 on p. 552). | |
| (The heights of these peaks above adjoining valleys at their base are 1,000 to 2,000 feet.) | |
| Junction of the South and North Forks of the Cheyenne River | 2470 |

ON THE INTERNATIONAL BOUNDARY.

[From reports of N. H. Winchell, H. Y. Hind, G. M. Dawson, R. G. McConnell, and the United States Northern Boundary Commission; referred to sea level by comparison with railway surveys.]

| | Feet above the sea. |
|--|---------------------|
| Lake Superior, low and high water, 599-604; mean | 602 |
| Mountain Lake, at head of Pigeon River..... | 1652 |
| South Lake, at head of Arrow River..... | 1535 |
| Water divide on the boundary, between South and North Lakes... | 1573 |
| North Lake, at head of waters draining to Rainy Lake..... | 1535 |
| Gunflint Lake..... | 1530 |
| Saganaga Lake..... | 1363 |
| Otter Track Lake..... | 1326 |
| Knife Lake..... | 1322 |
| Basswood Lake..... | 1244 |
| Lac la Croix (or Nequanquon Lake)..... | 1186 |
| Nomekan Lake..... | 1126 |
| Rainy Lake, low and high water, 1115-1120; mean..... | 1117 |

| | Feet above the sea. |
|--|---------------------|
| Lake of the Woods, low and high water, 1057-1063; mean..... | 1060 |
| Ridge 12 miles farther west, forming the watershed on the boundary between the Lake of the Woods and Roseau Lake..... | 1088 |
| Muskeg (swamp), forming other parts of this watershed, about.. | 1075- |
| Pine River..... | 1047 |
| Roseau Lake, about..... | 1040 |
| Ridge 3 miles west of Pine River..... | 1070 |
| Roseau River at Pointe d'Orme..... | 976 |
| Ridge 20 miles east of the Red River..... | 1016 |
| Ridge 12 miles east of the Red River..... | 848 |
| Emerson..... | 790 |
| Red River, low and high water, 747-787; ordinary stage..... | 752 |
| Gretna..... | 829 |
| Pembina Mountain, base and top..... | 1030-1500 |
| Pembina River, approximately..... | 1125 |
| General level of the adjoining country, about..... | 1540 |
| Lac des Roches in North Dakota and divide between this lake and Badger Creek in Manitoba, about..... | 1520 |
| Turtle Mountain (according to Dr. G. M. Dawson's map)..... | 2150 |
| Same (according to profile in report of the United States Boundary Commission)..... | 2000-2534 |
| Souris River, first crossing, about..... | 1400 |
| Same, second crossing, about..... | 1650 |
| Coteau du Missouri, base and crest..... | 1900-2140 |
| Wood Mountain, highest portion on the boundary..... | 2950-3075 |
| Same, north of the boundary..... | 3350 |
| White Mud River..... | 2550 |
| Boundary Plateau..... | 3000-3250 |
| East Fork of Milk River..... | 2790 |
| Wild Horse Lake..... | 2850 |
| Milk River, probably about..... | 2600 |
| West Butte, the highest of the Sweet Grass hills or Three Buttes.. | 6483 |
| East Butte..... | 6200 |
| Trail from Fort Benton to Fort MacLeod..... | 3548 |
| North Branch of Milk River 1 mile north of the boundary, long. 113° | 4173 |
| Eastern base of the Rocky Mountains, long. $113^{\circ} 25'$, about..... | 4500 |
| Waterton Lake (or Chief Mountain Lake), crossed by the boundary in long. $113^{\circ} 52'$, in the east edge of the Rocky Mountains.... | 4245 |
| Rocky Mountains, summits in the vicinity of this lake, on the continental watershed..... | 7500-10500 |

MANITOBA AND ADJOINING PARTS OF BRITISH AMERICA.

NORTH, NORTHEAST, AND NORTHWEST OF LAKE SUPERIOR.

[Mostly from reports of the Geological and Natural History Survey of Canada; in part corrected approximately by comparison with the survey of the Canadian Pacific Railway.]

| | Feet above the sea. |
|--|---------------------|
| Lake Superior..... | 602 |
| McKay's Mountain (Bayfield, quoted by Whittlesey)..... | 1824 |
| Mountains west of Thunder Bay (S. J. Dawson)..... | 1600 |
| Thunder Cape, east of Thunder Bay (S. J. Dawson)..... | 1950 |
| Mount Cambridge, on St. Ignace Island, south of Nepigon Bay, not the highest point of the island (Agassiz), about..... | 1600 |
| Kakabeka Falls, according to Keating and Agassiz, have a vertical descent of about 130 feet, the breadth of the Kaministiquia River there being about 50 yards, as stated by Keating, but about 150 yards by Agassiz. Captain Palliser, who visited this fall June 18, 1857, reports it as 115 feet high, with a breadth of 335 feet. Leveling by S. J. Dawson in August, 1857, found this fall and the rapids below together 119 feet. Of this the rapids, three-fourths of a mile long, are about 14 feet. | |
| The falls of Pigeon River, on the international boundary, are stated by Hind to be 120 feet high; this probably includes the rapids below to Lake Superior. Norwood says it "descends perpendicularly 60 feet." | |
| Lake Mistassini, about..... | 1350 |
| (Soundings in this lake show a depth of 374 feet.) | |

Feet above

Lake Mistassinis (Little Mistassini), east of the foregoing, about..
 Lake Abittibi, about.....

Height of land portage south of the east end of Lake Abittibi, on
 the route to Lac des Quinze on the Ottawa River, about.....

Lake Nipissing (Canadian Pacific Railway, from Dr. Bell).....

Missinaibi Lake, near the head of Missinaibi River, the western
 branch of the Moose River system, about.....

"Missinaibi Lake bears S. 48° W., is 24 miles long, nearly
 straight, and varies from $\frac{1}{2}$ to $1\frac{1}{2}$ miles in width." (Rep. of
 Prog., Can., 1875-'76, p. 330.)

Crooked Lake, close southwest of Missinaibi Lake, about.....

"It is $8\frac{1}{2}$ miles long, and averages less than a quarter of a mile
 in width."

Height of Land Portage between Crooked and Dog Lakes, approx-
 imately.....

Dog Lake, about 1 foot above the next.....

Mattagaming or Mattawagaming Lake, on the Upper Michipicoten
 River (Canadian Pacific Railway, from Dr. Bell).....

Lake Manitowick, on Michipicoten River, about.....

McKay's Lake, at the head of Pic River, 12 miles long and $2\frac{1}{2}$ miles
 wide.....

Kenogami or Long Lake, at head of Kenogami River, tributary to
 Albany River (Canadian Pacific Railway, from Dr. Bell).....

This lake is $54\frac{1}{2}$ miles long, and is mostly from $\frac{1}{2}$ mile to 2
 miles wide.

"The average breadth of the main section, 46 miles in length,
 found by taking the mean of 15 measurements, at equal dis-
 tances, is 104 chains, or a little over a mile and a quarter."
 (Rep. of Prog., Can., 1871-'72, p. 336.)

Dr. Bell states in a letter that the summit crossed by the

Height of Land Portage close south of this lake, and leading
 from it to Black River, is about 70 feet higher, being there-
 fore approximately 1,102 feet above the sea. This portage "is
 about $\frac{1}{2}$ mile long, and is over an accumulation of well-
 rounded boulders with gravel and earth filling the interspaces
 in part; at other parts the boulders are piled on each other
 quite naked. The valley between the rocky walls is about
 half a mile wide. The surface is somewhat level and there is
 a subordinate valley or depression sweeping around on the
 west side between the bulk of the accumulation of boulders
 and the rocky bluff on that side." The ancient water course
 thus described west of the portage is probably only a few
 feet above Kenogami Lake, having very nearly the same
 elevation as the divide between the Missinaibi and Michipico-
 ten Rivers. Both these low points of the watershed were
 doubtless occupied by rivers outflowing from glacial lakes
 on the north during the recession of the ice sheet.

The following (to Mountain Lake, inclusive) are northwest of Long
 Lake House, which is at the north end of Kenogami or Long
 Lake:

Manitou-namaig Lake, about 18 miles long, and from 12 rods to $1\frac{1}{2}$
 miles wide.....

Round Lake, half a mile from the last, also.....

Muddy Lake.....

Fleming's Lake.....

Ka-wa-kash-ka-ga-ma Lake.....

Egg Lake.....

Mountain Lake.....

Lake Nepigon (540 feet deep near Echo Rock).....

Great Dog Lake, 25 miles northwest of Thunder Bay.....

Depressions in the line of watershed northwest of Lake Superior ..

Lac des Mille Lacs.....

Shebandowan Lake, southeast of the last (S. J. Dawson).....

Kashaboibe Lake, between the last two (S. J. Dawson).....

Lonely Lake (Lac Seul).....

This altitude, determined independently, probably requires
 some subtraction, for the description of the canoe route
 from Lonely Lake to Lake St. Joseph shows that the latter
 is the higher, the difference being apparently 20 feet or more.

Feet above the sea.

| | |
|--|-------------|
| Lake St. Joseph (mean of ten barometric observations on as many days)..... | 1172 |
| Lake Lansdowne, near the head of the Attawapishkat River, about..... | 960 |
| Lake Winnipeg, mean..... | 710 |
| Low and high water, approximately..... | 708-713 |
| Lake St. Martin (maximum depth 18 feet)..... | 794 |
| Lake Manitoba, mean, 809; low and high water, approximately.... | 805-813 |
| Lake Winnipegosis, mean, 828; low and high water, approximately.. | 825-831 |
| Lake Dauphin..... | 839 |
| Swan Lake (mean depth, 6 feet), about..... | 860 |
| Watershed between Lake Winnipegosis and Cedar Lake..... | 875 |
| Cedar Lake, on the Saskatchewan..... | 824 |
| Butte St. John, the highest point of Turtle Mountain in Manitoba (Andreas)..... | 2200 |
| Pembina Mountain, crest of the escarpment..... | 1400-1500 |
| Tiger Hills..... | 1500-1600 |
| Big Tiger Hill, north of Lang's Valley, about..... | 1640 |
| Brandon Hills..... | 1550-1600 |
| (The four preceding are from the United States Geological Survey of Lake Agassiz.) | |
| Riding Mountain, about..... | 2000 |
| Duck Mountain..... | 2300-2700 |
| Thunder Hill..... | 1900 |
| Porcupine and Pasquia Hills, about..... | 2000 |
| Long Lake, west of Last Mountain..... | 1598 |
| This lake extends about 50 miles from north to south, varies from $\frac{1}{4}$ of a mile to 2 miles in width, and is inclosed by bluffs about 250 feet high. | |
| Island Lake, about 125 miles east from the north end of Lake Winnipeg, estimated..... | 900 |
| The shores and islands of this lake abound in low outcrops of Archean rocks; but the surrounding land is for the greater part nearly level till, which "has an average elevation above the water of apparently less than 50 feet." Dr. Bell writes: "This lake is very appropriately named, being literally filled with islands in every part. The aggregate area of these islands is apparently as great as that of the water surface. The number probably amounts to several thousands." | |
| Wintering Lake..... | 588 |
| Landing Lake..... | 624 |
| The two foregoing are north of Sipi-wesk Lake and west of the Nelson River. | |
| Churchill River, 105 miles from its mouth, in the direction S. 33° W. (astr.), at the mouth of the Little Churchill River..... | 705 |
| Was-kai-ow-a-ka Lake, at the head of the Little Churchill River.. | 936 |
| Churchill River, 23 miles above the mouth of the Little Churchill. | 878 |
| Frog portage, from the Churchill River to the Lake of the Woods, at the head of a chain of lakes and streams flowing southward to the Saskatchewan, estimated..... | 1200 |
| The following altitudes, from Isle à la Crosse Lake to Lake Athabasca, which are here noted as determined by Sir John Richardson (Arctic Expedition in search of Sir John Franklin), probably require an average addition of about 200 feet: | |
| Isle à la Crosse Lake, on the Churchill River..... | 1300 [1500] |
| Thence southward to Carleton House on the North Saskatchewan, about 70 miles above the junction of the South and North Saskatchewan Rivers [estimated 1,200 feet above the sea], Richardson reports a descent of about 200 feet, across "an undulating country, but without any marked acclivity." | |
| Professor Macoun states that Isle à la Crosse, Clear, and Buffalo Lakes "are on the same level," being stagnant water filled with green scum in summer. | |
| Methy Lake or Lac la Loche..... | 1490 [1690] |
| Same, according to Captain Lefroy, cited by Richardson..... | 1500 [1700] |
| Summit of Methy portage (also called Portage la Loche and the Long Portage), on the watershed between the Churchill and Athabasca Rivers..... | 1556 [1756] |
| The "Coxcomb," on this portage at the crest of the bluff descending to the Clearwater River, tributary to the Athabasca..... | 1534 [1734] |

| | Feet above the sea. |
|--|---------------------|
| Clearwater River at the north end of this portage | 900 [1100] |
| Lake Athabasca | 600 [800] |
| Altitudes determined by Dr. G. M. Dawson show the present height of the glacial lake bed now drained by the Peace River, and of its probable first avenues of outflow southeast to Lake Agassiz, as follows: | |
| Peace River at Dunvegan | 1300 |
| Top of river bluff 1 mile from Dunvegan | 2100 |
| General level of the country in this vicinity | 2200 |
| Area of lacustrine silt in the basin of the Peace River | 2000-2500 |
| The valley of this part of the river, 800 or 900 feet deep, is eroded in a vast plain, from which, according to Richardson, "the Rocky Mountains are not visible, and no range of hills meets the eye." | |
| Watershed between Peace River and Lesser Slave Lake | 2430 |
| Watershed between Tow-ti-now River, a tributary of the Athabasca, and the North Saskatchewan, on the trail from Athabasca Landing to Edmonton | 2485 |

REGION OF THE CYPRESS HILLS, WOOD MOUNTAIN, AND ADJOINING COUNTRY.

[From R. G. McConnell, in the Annual Report of the Geological and Natural History Survey of Canada, for 1885. The original figures are here increased by 24 feet, because they are referred to elevations on the Canadian Pacific Railway, which, as there published, require this addition.]

| | Feet above the sea. |
|---|---------------------|
| Coteau du Missouri, east of the south end of Old Wives' Lake | 2394 |
| Same, at Secretan | 2292 |
| Same, in the Vermilion Hills, south of the South Saskatchewan River | 2254 |
| Same, in the lakelet-sprinkled plateau north of this river, in Ts. 21 to 24, Rs. 10 to 14 | 2000-2300 |
| Wood Mountain | 3000-3350 |
| East part of the Cypress Hills | 3800-4243 |
| The Gap from north to south through the Cypress Hills | 3744 |
| West part of the Cypress Hills | 4600-4867 |
| Upper limit of glacial drift there, about | 4400 |
| Upper limit of glacial drift on the Hand Hills, 150 miles northwest from the foregoing (according to J. B. Tyrrell, Ann. Rep., 1886, p. 145 E), about | 3200 |
| Upper limit of drift observed by Dr. G. M. Dawson on the West Butte of the Sweet Grass Hills, nearly south of the Hand Hills, being close south of the international boundary in longitude 111° 30' | 4660 |
| [The surface of the ice-sheet thus declined here from south to north about 7 feet per mile, unless these differences in elevation of the upper limit of the drift have resulted from postglacial changes of level, which indeed appears to be the more probable explanation.] | |
| South Saskatchewan River, at mouth of Red Deer River | 1958 |
| Same, in T. 22, R. 18, long. 108° 27' | 1782 |
| Same, at the Elbow | 1619 |
| Old Wives' Lake (the northern lake) | 2189 |
| The northern and southern lakes, connected by a sluggish creek, have probably the same elevation. | |
| Many Island Lake, 25 miles ENE. of Medicine Hat | 2304 |
| Big Stick Lake, 60 miles ENE. of Medicine Hat | 2278 |
| Crane Lake, 10 miles SE. of the last | 2444 |
| Cypress Lake, at the southeast base of the Cypress Hills | 3264 |
| Twelve-Mile Lake, at the northeast base of Wood Mountain | 2479 |
| Devil's Lake, 20 miles west from the Elbow of the South Saskatchewan River | 1911 |
| (Many other elevations are also given in this report and the accompanying map.) | |

REGION OF THE BOW AND BELLY RIVERS.

[From Dr. George M. Dawson in the Report of Progress of the Geological and Natural History Survey of Canada for 1882-83-84. These are from barometric observations referred to sea level by comparison with the barometric record at Fort Benton, Montana, which is assumed to have an elevation of 2,700 feet. At Lethbridge they agree, at least approximately, with the Northwest Coal and Navigation Company's Railway.]

| | Feet above the sea. |
|--|---------------------|
| Confluence of the Bow and Belly Rivers, forming the South Saskatchewan River..... | 2212 |
| Belly River, at the "Coal Banks," Lethbridge..... | 2717 |
| Old Man River, at Fort MacLeod..... | 3096 |
| St. Mary River, 6 miles north of the 49th parallel..... | 3850 |
| Waterton River, near its junction with the Upper Belly River..... | 3217 |
| Waterton Lake, crossed by the international boundary in long. 113° 52', in the east edge of the Rocky Mountains..... | 4245 |
| Lake Pa-kow-ki, 45 miles SSW. of Medicine Hat..... | 2735 |
| Milk River, at Pa-kow ki Coulee, 4 miles southeast from the south end of this lake..... | 2816 |
| Same, at Verdigris Coulee..... | 3065 |
| Same, at the crossing of the trail from Fort MacLeod to Fort Benton..... | 3546 |
| Same, 20 miles west of this crossing..... | 3720 |
| North Branch of Milk River, 1 mile north of the 49th parallel, long. 113°..... | 4173 |

(Many other elevations are also given in this report and the accompanying map.)

IN NORTHERN ALBERTA AND PORTIONS OF ASSINIBOIA AND SASKATCHEWAN.

[From J. B. Tyrrell in the Annual Report of the Geological and Natural History Survey of Canada for 1888. The original figures are here increased by 24 feet, because they are referred to elevations on the Canadian Pacific Railway, which, as there published, require this addition.]

| | Feet above the sea. |
|--|---------------------|
| Hand Hills..... | 3575 |
| Wintering Hills..... | 3250 |
| Medicine Lodge Hills..... | 3500 |
| Neutral Hills, broken ridges rising westward to the "Nose"..... | 2500-2990 |
| Beaver Hills..... | 2500 |
| Blackfoot Hills..... | 2400 |
| Egg Lake in T. 56, R. 16, near Victoria..... | 2021 |
| Birch Lake..... | 2164 |
| Beaver Lake..... | 2202 |
| Hastings Lake..... | 2404 |
| Cooking Lake..... | 2424 |
| Wavy Lake..... | 2284 |
| Buffalo Lake..... | 2560 |
| Bear Lake..... | 2648 |
| Pigeon Lake..... | 2848 |
| Battle Lake..... | 2794 |
| Buck Lake..... | 2994 |
| Gull Lake..... | 2929 |
| Devil's Pine Lake..... | 2934 |
| Quill Lakes..... | 2885 |
| Sullivan Lake..... | 2644 |
| Dowling Lake..... | 2587 |
| Egg Lake, in the Hand Hills..... | 2994 |
| Little Fish Lake..... | 2914 |
| Sounding Lake, at the east end of the Neutral Hills..... | 2164 |
| Red Deer River, at crossing of the Rocky Mountain House trail, near the mouth of Raven River..... | 3196 |
| Same, at the ferry on the trail from Calgary to Edmonton..... | 2751 |
| Same, at mouth of Tail Creek, outlet of Buffalo Lake..... | 2414 |
| Same, at mouth of Rosebud or Arrow-Wood Creek..... | 2254 |
| Same, at the Lorne crossing..... | 2191 |
| Battle River, at the "Leavings," on the trail from Calgary to Edmonton..... | 2481 |
| Same, Dried Meat Lake, 11 miles long and about $\frac{1}{4}$ mile wide, through which the river flows..... | 2254 |
| Same, at the Elbow, the most southern point of its course..... | 2150 |
| Same, at crossing of the Fort Pitt trail, southeast of the Blackfoot Hills..... | 1718 |

(Many other elevations, including those of the North Saskatchewan River previously noted, are given in this report and the accompanying map.)



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INDEX OF HILLS AND MOUNTAINS.

MINNESOTA.

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| Fergus Falls, hills east of. | 187 | 1,300 | Mountain Lake, hills near | 184 | 2,003 |
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| Agemok | 185 | 1,568 | Carnelian | 63 | 873 |
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| Ash | 185 | 1,568 | Clear, Washington Co. | 183 | 889 |
| Aue | 97 | 942 | Clearwater, Anoka Co. | 183 | 885 |
| Badger | 79 | 1,173 | Clearwater, Carver Co. | 85 | 963 |
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| Bass, Hennepin Co. | 97, 125 | 878 | Cokato | 82 | 986 |
| Bass, Itasca Co. | 149 | 1,279 | Como | 183 | 885 |
| Bass, Otter Tail Co. | 32 | 1,328 | Cormorant | 176 | 1,340 |
| Bass, Big, Ramsey Co. | 60 | 888 | Crane | 186 | 1,150 |
| Bass, Little, Itasca Co. | 149 | 1,283 | Crooked, Cook Co. | 185 | 1,585 |
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| Grass..... | 179 | 1, 355 | Whitewater | 50, 179 | 1, 634 |
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| Cedar | 181, 191 | 824 | Little | 181 | 710 |
| Clear | 191 | 1,500 | Sipi-week | 181 | 565 |
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| Buffalo | 180 | 1,635 | Long | 57, 180, 191 | 1,598 |
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| Crescent | 56 | 1,679 | Old Wives' | 192 | 2,189 |
| Crooked | 180 | 1,389 | Pa-kow-ki | 193 | 2,735 |
| Cypress | 192 | 3,264 | Round | 180 | 1,364 |
| Devil's | 192 | 1,911 | Sand Hill | 180 | 1,685 |
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| Bear | 193 | 2,648 | Egg, near Victoria | 193 | 2,021 |
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| Buck | 193 | 2,994 | Little Fish | 193 | 2,914 |
| Buffalo | 193 | 2,660 | Pigeon | 193 | 2,848 |
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| Cooking | 193 | 2,424 | Sullivan | 193 | 2,644 |
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| Dried Meat | 193 | 2,254 | | | |

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MISSOURI.

(Chicago, St. Paul and Kansas City Railway.)

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| Cawood..... | 135 | 935 | St. Joseph | 135 | 820 |
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| Ravenwood | 135 | 1,015 | | | |
| Rea..... | 135 | 1,064 | | | |

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| Abercrombie | 99 | 935 | Babcock..... | 68 | 1,324 |
| Absaraka | 92 | 1,080 | Barlow | 37 | 1,545 |
| Addison | 90 | 917 | Barney | 33 | 1,033 |
| Adrian..... | 36 | 1,355 | Barrett | 90 | 953 |
| Alicia | 68 | 1,157 | Bartlett | 73 | 1,529 |
| Almont | 23 | 1,920 | Barton | 81 | 1,505 |
| Alta | 22 | 1,427 | Bathgate | 84 | 821 |
| Alton..... | 83 | 898 | Beach | 24 | 2,756 |
| Amenia..... | 90 | 964 | Bean's..... | 34 | 893 |
| Andrews | 24 | 2,478 | Belfield..... | 24 | 2,579 |
| Antelope | 23 | 2,411 | Belle Plaine | 88 | 1,270 |
| Apple Creek | 23 | 1,644 | Berlin | 86 | 1,470 |
| Ardock | 84 | 824 | Berthold..... | 74 | 2,082 |
| Argusville..... | 83 | 884 | Berwick..... | 74 | 1,482 |
| Arthur | 90 | 992 | Bisbee..... | 81 | 1,600 |
| Arvilla | 72 | 1,017 | Bismarck | 23 | 1,670 |
| Auburn | 84 | 842 | Blanchard | 90 | 947 |
| Avoca | 74 | 1,956 | Bloom | 22 | 1,486 |
| Ayr | 82 | 1,200 | Blue Grass | 23 | 2,011 |

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| Rauville | 86 | 1, 757 | Watertown (St. P., M. & M.) | 86 | 1, 726 |
| Raymond | 117 | 1, 458 | Watertown Junction | 119, 120 | 1, 604 |
| Redfield (C., M. & St. P.) | 115 | 1, 295 | Waubay | 98 | 1, 813 |
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| Ree Heights | 119 | 1, 731 | Webster | 98 | 1, 842 |
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| Crookston | 145 | 2,670 | Norfolk Junction | 145 | 1,516 |
| Fort Robinson | 145 | 3,775 | Stuart | 145 | 2,151 |
| Fremont | 145 | 1,193 | Thacher | 145 | 2,649 |
| Gordon | 145 | 3,547 | Valentine | 145 | 2,579 |

WYOMING.

(Fremont, Elkhorn and Missouri Valley Railroad.)

| | | | | | |
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| Douglas | 145 | 4,810 | Van Tassell | 145 | 4,727 |
| Fisher | 145 | 4,752 | | | |

IDAHO.

(Northern Pacific Railroad.)

| | | | | | |
|---------------|----|-------|--------------------|----|-------|
| Algoma | 26 | 2,214 | Clark's Fork | 26 | 2,066 |
| Athol | 26 | 2,210 | Granite | 26 | 2,290 |
| Cabinet | 26 | 2,187 | Hope | 26 | 2,108 |
| Chilco | 26 | 2,450 | Sand Point | 26 | 2,100 |

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(Northern Pacific Railroad.)

| | | | | | |
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| Alderton | 29 | 65 | Kennewick | 27 | 350 |
| Badger | 27 | 687 | Kiona | 27 | 499 |
| Bender | 27 | 639 | Lakeview | 27 | 324 |
| Boisé Creek | 28 | 685 | Lind | 26 | 1,363 |
| Buckley | 29 | 716 | Mabton | 27 | 722 |
| Cañon | 28 | 1,790 | Marshall Junction | 26 | 2,134 |
| Cascade | 29 | 473 | Martin | 28 | 2,777 |
| Castle Rock | 27 | 83 | Maywood | 28 | 1,345 |
| Centralia | 27 | 207 | Meeker | 29 | 62 |
| Chehalis | 27 | 204 | Nelson's | 28 | 2,032 |
| Clealum | 28 | 1,912 | Palmer | 28 | 874 |
| Cole | 28 | 2,164 | Palouse Junction | 26 | 858 |
| Eagle Gorge | 28 | 1,088 | Pasco Junction | 26, 27 | 385 |
| Easton | 28 | 2,171 | Prosser | 27 | 668 |
| Ellensburg | 28 | 1,513 | Puyallup | 29 | 45 |
| Eltopia | 26 | 600 | Relief | 27 | 565 |
| Enumclaw | 28 | 734 | Reservation | 29 | 12 |
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(Northern Pacific Railroad.)

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| Bridge Creek | 54 | 1,600 | Niverville | 49 | 774 |
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